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Portable Generators

G 2.1A
G 3.3A
G 4.6A
GS 4.6A
GS 5.7A

REPAIR MANUAL

This manual covers machines with Serial Number or Item Number:

0008243, 0008244, 0008245, 0008246, 0008247, 0008248, 0008249,
0008250, 0008251, 0008252, 0008253, 0008254, 0008255, 0008256, 0008257, 0008258, 0008259,
0008260, 0008261, 0008262, 0008263, 0008264, 0008265, 0008266, 0008267, 0008268, 0008269,
0008270, 0008271, 0008272, 0008273, 0008274, 0008275, 0008276, 0008277, 0008278, 0008279,
0008280, 0008281, 0008282, 0008283, 0008284, 0008285, 0008309, 0008310, 0008311, 0008312,
0008313, 0008314, 0008315, 0008316

Operating/Parts Information

You must be familiar with the operation of this machine before you attempt to troubleshoot or make any repairs to it. Basic operating and maintenance procedures are described in the operator's/parts manual supplied with the machine. The operator's/parts manual should be kept with the machine. Use it to order replacement parts when needed. If this manual becomes lost, please contact WACKER Corporation to order a replacement.

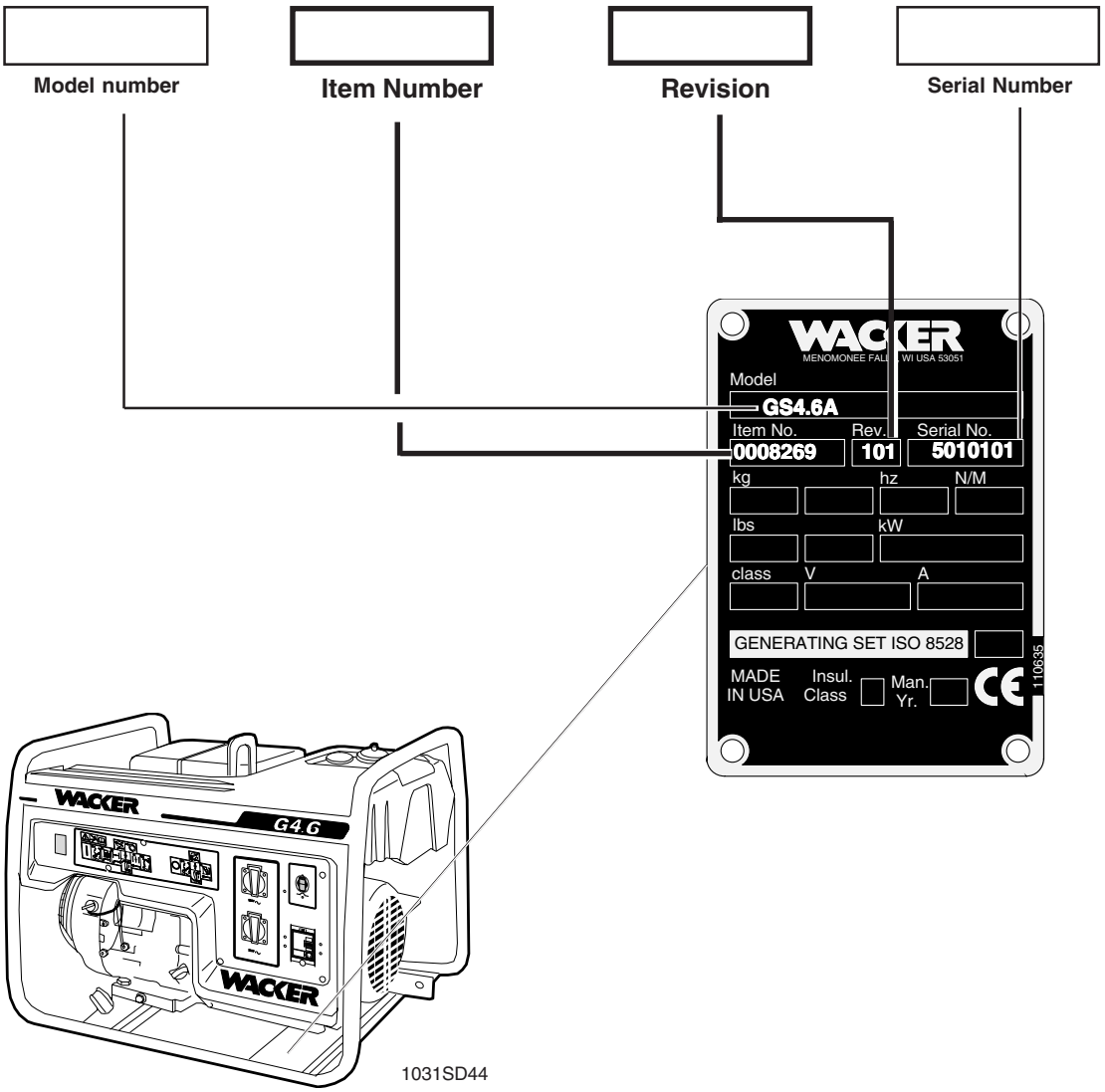
Damage caused by misuse or neglect of the unit should be brought to the attention of the operator, to prevent similar occurrences from happening in the future.

This manual provides information and procedures to safely repair and maintain this WACKER model. For your own safety and protection from injury, carefully read, understand and observe the safety instructions described in this manual. THE INFORMATION CONTAINED IN THIS MANUAL WAS BASED ON MACHINES IN PRODUCTION AT THE TIME OF PUBLICATION. WACKER CORPORATION RESERVES THE RIGHT TO CHANGE ANY PORTION OF THIS INFORMATION WITHOUT NOTICE.

Nameplate

A nameplate listing the Model Number, Item Number, Revision, and Serial Number is attached to each unit. Please record the information found on this plate so it will be available should the nameplate become lost or damaged. **When ordering parts or requesting service information, you will always be asked to specify the model, item number, revision number, and serial number of the unit.**

My machine's numbers are:



50 Hz Portable Generators Repair Manual

Table of Contents

50 Hz Portable Generators Repair Manual

Table of Contents, continued

1.1 Safety Information

This manual contains DANGER, WARNING, CAUTION, and NOTE callouts which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Used without the safety alert symbol, CAUTION indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Note: *Contains additional information important to a procedure.*

1.2 Laws Pertaining to Spark Arresters

Notice: Some local authorities require that in certain locations, spark arresters be used on internal combustion engines. A spark arrester is a device designed to prevent the discharge of sparks or flames from the engine exhaust. It is often required when operating equipment on forested land to reduce the risk of fires. Consult the engine distributor or local authorities and make sure you comply with regulations regarding spark arresters.

WARNING

BACKFEED FROM THE GENERATOR INTO THE PUBLIC POWER DISTRIBUTION SYSTEM CAN CAUSE SERIOUS INJURY OR DEATH TO UTILITY WORKERS!

Improper connection of generator to a building's electrical system can allow electrical current from the generator to backfeed into utility lines. This could result in electrocution of utility workers, fire, or explosion. Connections to a building's electrical system must be made by a qualified electrician and comply with all applicable laws and electrical codes.

1.3 Operating Safety

Familiarity and proper training are required for the safe operation of electrical equipment! Equipment operated improperly or by untrained personnel can be dangerous! Read the operating instructions and familiarize yourself with the location and proper use of all instruments and controls. Inexperienced operators should receive instruction from someone familiar with the equipment before being allowed to operate the generator.

WARNING

NEVER operate generator when open containers of fuel, paint, or other flammable liquids are nearby.

NEVER operate generator, or tools attached to the generator, with wet hands.

NEVER use worn electrical cords. Severe electrical shock and equipment damage may result.

NEVER run generator indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided. Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death.

NEVER run electrical cords under the generator, or over vibrating or hot parts.

NEVER enclose or cover generator when in use or when hot.

NEVER overload generator. The total amperage of the tools and equipment attached to the generator must not exceed the load rating of the generator.

NEVER allow untrained personnel to operate or service the generator. Know how to operate and stop generator before starting it.

NEVER operate generator in snow, rain, or standing water.

ALWAYS keep generator at least three feet (one meter) away from structures, buildings, and other equipment during use.

ALWAYS keep generator out of reach of children and pets.

ALWAYS keep the area immediately surrounding the generator clean, neat and free of debris.

ALWAYS position and operate generator on a firm, level surface.

ALWAYS remove all tools, cords, and other loose items from generator before starting it.

ALWAYS make certain generator is well-grounded and securely fastened to a good earthen ground.

ALWAYS transport generator in an upright position.

1.4 Engine Safety

Internal combustion engines present special hazards during operation and fueling! Read and follow warning instructions in engine owner's manual and safety guidelines below. Failure to follow the safety guidelines described below could result in severe injury or death.

WARNING

DO NOT run engine indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.

DO NOT fill or drain fuel tank near an open flame, while smoking, or while engine is running.

DO NOT fill fuel tank indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans, is provided.

DO NOT touch or lean against hot exhaust pipes.

DO NOT operate with the fuel tank cap loose or missing.

DO NOT add fuel to a hot or running engine.

DO NOT start engine if fuel has spilled or an odor of fuel is present. Move generator away from the spill and wipe generator dry before starting.

1.5 Service Safety

Poorly maintained equipment can become a safety hazard! In order for the equipment to operate safely and properly over a long period of time, periodic maintenance and occasional repairs are necessary. If the generator is experiencing problems or is being serviced, attach a "DO NOT START" sign to the control panel to notify other people of its condition.

WARNING

NEVER allow water to accumulate around the base of the generator set. If water is present**,** move the generator and allow it to dry before servicing.

NEVER service generator if clothing or skin is wet.

NEVER use gasoline or other low flash point solvents to clean air filter elements.

NEVER allow untrained personnel to service this equipment. Only trained electrical technicians should be allowed to service the electrical components of this equipment.

NEVER modify the equipment without express written approval from WACKER Corporation.

ALWAYS replace all guards and safety devices immediately after servicing.

ALWAYS turn engine off before servicing generator. If engine has electric start, disconnect negative terminal on battery.

ALWAYS keep generator clean and labels legible. Replace all missing and hard-to-read labels. Labels provide important operating instructions and warn of dangers and hazards.

ALWAYS let engine cool before transporting or servicing.

ALWAYS remain aware of moving parts and keep hands, feet, and loose clothing away from moving parts on generator and engine.

ALWAYS keep fuel lines in good condition and properly connected. Leaking fuel and fumes are extremely explosive.

Notes:

2.1 Generator Specifications

Table 2-1.

Model		G2.1A	G3.3A	G4.6A	GS4.6A	GS5.7A
Output	kVA	2,1	3,3	4,6		4,1 1Ø 5,7 3Ø
Type		Brushless	Automatic Voltage Regulator			
AC Voltages available voltage & phase		230V 1 phase				230V 1Ø 400V 3Ø
Frequency	Hz	50				
Power Factor		1,0				1,0 1Ø 0,8 3Ø
AC Receptacles		Optional				
Main Circuit Breaker	amp	10 (1 pole)	15 (1 pole)	20 (1 pole)		9 (3 pole)
Continuous Current at 230V/400V	amp	9,1/N.A.	14,3/N.A.	20,0/N.A.		18,0/8,2
L x W x H	mm	685 x 445 x 435	685 x 585 x 530			
Weight (dry)	Kg	44	71	80	83	83
Battery		N/A	N/A	N/A	50-N18L-A/12/20	

2.2 Engine Specifications

Table 2-2.

Model		G2.1A	G3.3A	G4.6A	GS4.6A	GS5.7A
Engine Make		Honda				
Engine Model		GX 160 K1VX	GX 240 K1	GX 340 K1		
Power @ 3000 rpm	kW	4,1	6,0	8,2		
Displacement cubic	cm	163	242	337		
Operating Speed – no load	rpm	3100 ± 50				
Operating Speed – full load	rpm	3000 ± 50				
Auto Idle Speed	rpm	N/A	2200 ± 50			
Valve Clearance (cold) exhaust intake	 mm	 0,20 0,15				
Spark Plug	type	BPR6ES/W20EPR-U				
Spark Plug Gap	mm	0,7 – 0,8				
Starter	(type / V)	N/A	N/A	N/A	Electric / 12V	
Alternator	amp	N/A	N/A	N/A	1	
Fuel	Type	Regular unleaded (Min. 77 Octane)				
Fuel Consumption	liter/hr	1,7	2,4	3,2		
Fuel Tank Capacity	liter	3,7	19,5			
Running Time	hr.	2,2	8,2	6,0		
Air Cleaner	type	Dry type with oil-wetted foam pre-cleaner				
Engine Lubrication Capacity	oil grade service class ml	SAE 10W30 SG, SF, or SE 600	SAE 10W30 SG or SF 1100			

3.1 Determining Power Requirements

These generators are designed to operate single-phase, 50 hertz appliances or tools running at 230 VAC for the G2.1A, G3.3A, G4.6A, and GS4.6A models, and a single phase voltage of 230 VAC and a three phase voltage of 400 VAC for the GS5.7A model. Check the nameplate or label provided on tools and appliances to make sure their power requirements match the power output of the generator.

Some appliances and tools require a surge of current when starting. This means that the amount of power needed to initially start the equipment is larger than the power required to keep it running. The generator must be capable of supplying this "surge" current. Other types of appliances require more power than is actually stated on their nameplates.

The chart below is offered only as a general guideline to help you in determining power requirements for different types of equipment. Check with your nearest WACKER Dealer, or contact the manufacturer or dealer of the tool or appliance, with questions regarding power requirements.

- Incandescent lights and appliances such as irons and hot plates use a resistive-type heating element and require the same wattage to start and run as is stated on their nameplates.
- Fluorescent and mercury lamps require 1.2 – 2 times their stated wattage to start.
- Electrical motors and many types of electrical tools often require a large starting current. The amount of starting current depends on the type of motor and its use.
- Most electrical tools require 1.2 – 3 times their stated wattage for running.
- Loads such as submersible pumps and air compressors require a very large force to start. They need as much as 3 – 5 times the wattage stated on their nameplates in order to start.

If the wattage is not given for a particular tool or appliance, it can be calculated by multiplying its voltage and amperage requirements:

VOLTS x AMPS = WATTS

CAUTION: If a tool or appliance does not reach full speed within a few seconds when switched on, turn it off immediately to avoid damage.

CAUTION: When starting loads, DO NOT exceed two (2) times the given Continuous Current rating for model G2.1A, or one-and-one-half (1 1/2) times for all other models, as damage to the generator may occur. See Section 2.1 *Generator Specifications*.

3.2 Outdoor Installation

Place the generator in an area where it will not be exposed to rain or snow. Make sure it is positioned on firm, level ground so it will not slide or shift. Position engine exhaust away from areas where people may be present.

If operating the generator inside a tunnel or deep trench, make sure there is adequate ventilation. Precautions similar to those required when operating indoors may be necessary.

The surrounding area must be free of water and moisture. All components must be protected from excessive moisture.

3.3 Indoor Installation

If the generator must be operated indoors, adequate ventilation or exhaust hoses must be provided. When venting exhaust fumes, make sure the exhaust piping is large enough to prevent excessive back pressure to the engine. Back pressure reduces engine efficiency and may cause the engine to overheat.

WARNING

Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death. Never run generator indoors or in an enclosed area unless adequate ventilation, through such items as exhaust fans or hoses, is provided.

When operated indoors, steps to prevent fire and explosion such as, providing a good earthen ground, removing all flammable materials near generator, and using only electric cords in good condition, must be observed. See Section 1.3 *Operating Safety.*

3.4 Grounding the Generator

The generator should be grounded to a good ground source in compliance with National Electric Code standards and local regulations.

Use #8 wire and secure one end to the ground terminal **(a)** provided on the generator frame and the other end to a suitable ground source. See Figure 3-1.

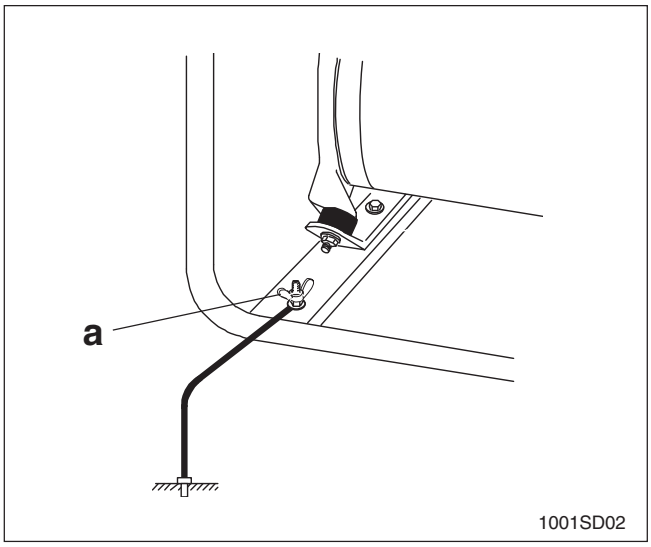


Figure 3-1. Grounding

3.5 Use of Extension Cords

When a long extension cord is used to connect an appliance or tool to the generator, a voltage loss occurs – the longer the cord, the greater the voltage loss. This results in less voltage being supplied to the appliance or tool and increases the amount of current draw or reduces performance. A heavier cord with a larger wire size will reduce the voltage loss.

Use Table 3-1 below as a guide for selecting proper cable size.

Use only extension cords rated for outdoor use and equipped with a third-wire ground.

Table 3-1.

Current	Load in Watts		Maximum Cable Length in Ft.			
Amps	120V	240V	#10	#12	#14	#16
2.5	300	600	1000 ft.	600 ft.	375 ft.	250 ft.
5	600	1200	500 ft.	300 ft.	200 ft.	125 ft.
7.5	900	1800	350 ft.	200 ft.	125 ft.	100 ft.
10	1200	2400	250 ft.	150 ft.	100 ft.	
15	1800	3600	150 ft.	100 ft.	65 ft.	
20	2400	4800	125 ft.	75 ft.	50 ft.	

CAUTION: Operating equipment at low voltage can cause overheating.

WARNING

Keep electrical cords in good condition. **DO NOT** use worn, bare, or frayed cords which can cause electrical shock.

4.1 Theory of Operation – Capacitor Generators

Basic Generator Theory

Wacker air-cooled generators work on the principle of electromagnetic induction i.e., the cutting of magnetic lines of force by a coil of wire to produce an electric voltage in the coil of wire.

The two main components of the generator, the rotor and stator, are the key. The rotor acts as the magnet and the stator acts as the coil of wire. As the rotor rotates, its magnetic lines of force are cut by the coils of wire in the stationary stator. The voltage induced in the windings of the stator is tapped off and available at the receptacles.

Brushless Generator

This model generator uses a brushless design to generate and regulate power. It consists of a rotor, stator, diodes, and an auxiliary winding. The brushless generator also contains a capacitor that is connected to the auxiliary winding. Its purpose is to regulate the voltage in the main windings and prevent a voltage drop when a load is applied.

This generator is designed to operate with single phase loads at or near a power factor of 1.0. The principle of operation is schematically represented in Figure 4-1, and a cross-sectional view in Figure 4-2. The auxiliary winding **(a)**, in conjunction with the capacitor, provide excitation by inducing current in the rotor windings **(b)** which is rectified by the diodes **(c)** to produce direct current. The main stator winding **(d)** is designed for parallel connection to give a voltage output with no voltage adjustment possible.

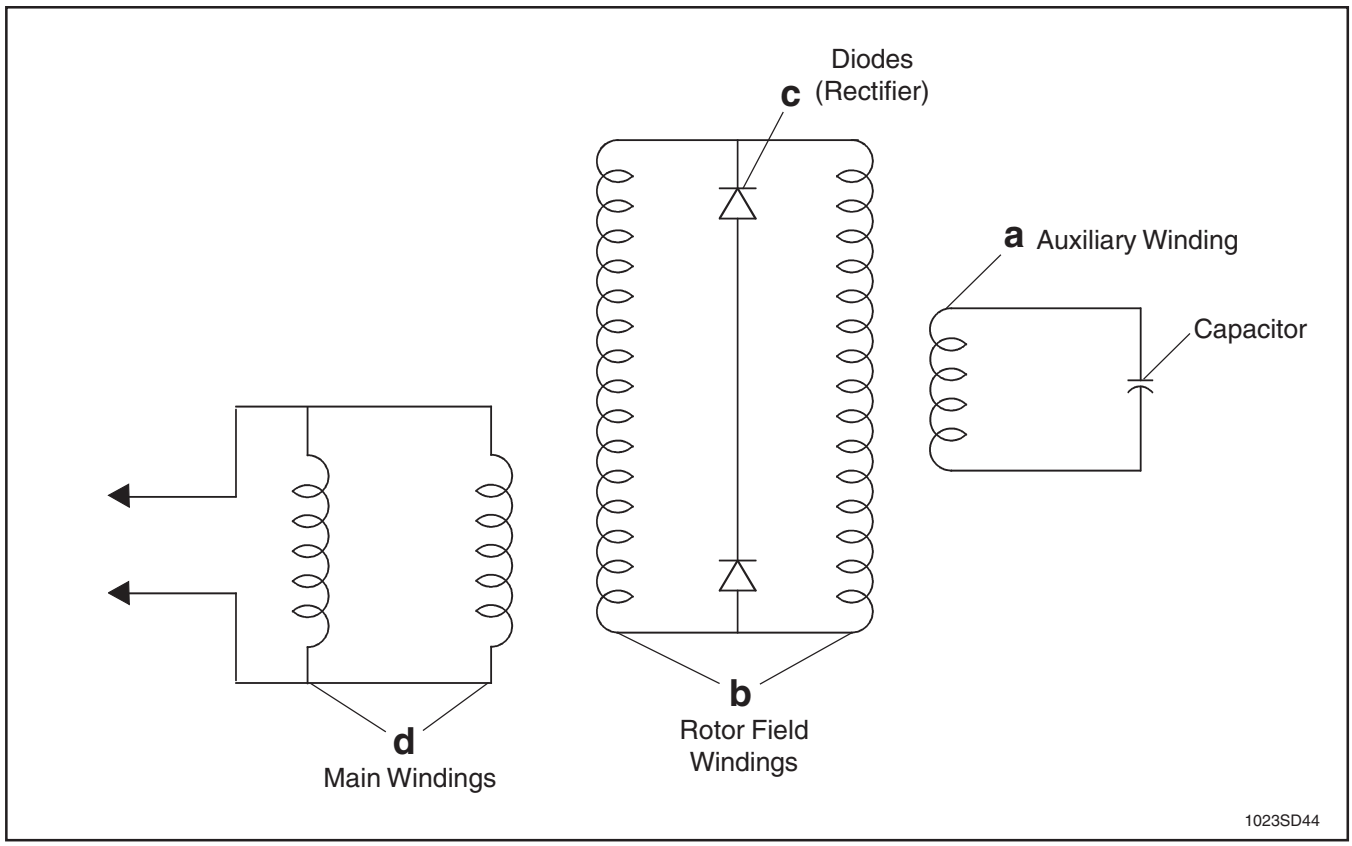


Figure 4-1. Principle of Operation Schematic

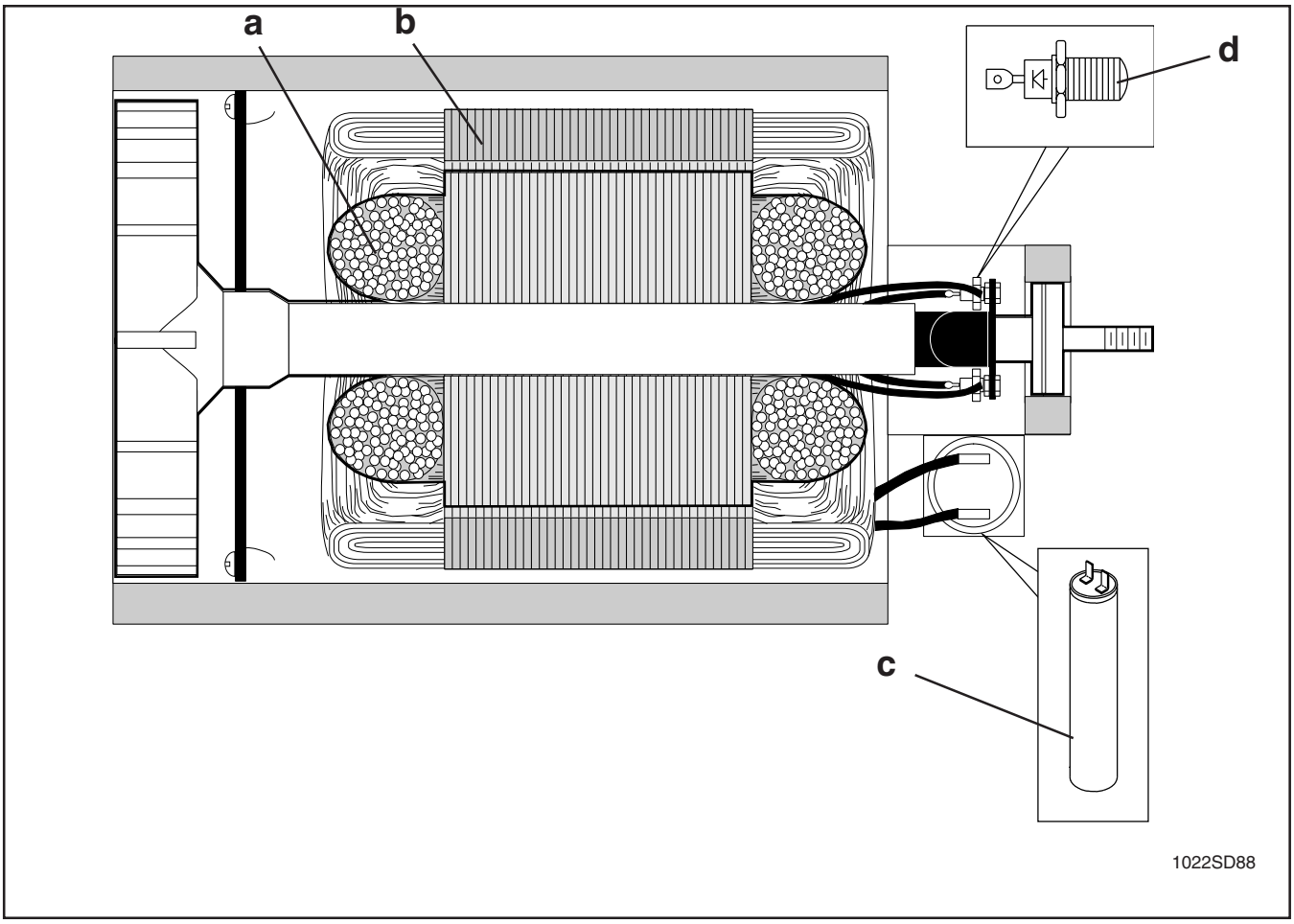


Figure 4-2. Brushless Type Generator

4.2 Rotor (a)

The inside of the rotor shaft is tapered and connected directly to the taper on the engine crankshaft. This end is supported by the engine crankshaft bearing. The opposite end of the rotor is supported by a bearing installed in the generator housing. This end also contains the two diodes mounted on the diode bracket assembly. There are two individual coils wound on the rotor. When the engine is running, these two windings create the magnetic field for the main stator windings.

4.3 Stator (b)

The stator houses both the main windings and auxiliary winding. The main windings are connected directly to the main circuit breaker to supply power to the output receptacles. The auxiliary winding induces the initial voltage in the field windings of the rotor and regulates the voltage. It is connected directly to the main capacitor.

4.4 Capacitor (c)

A capacitor is connected in series with the auxiliary winding. Its purpose is to regulate the voltage when a load is applied.

4.5 Diodes (d)

Two diodes are located on the rotor. These diodes form a half wave rectifier to convert the induced AC voltage in the rotor windings to DC voltage.

4.6 Control Panel

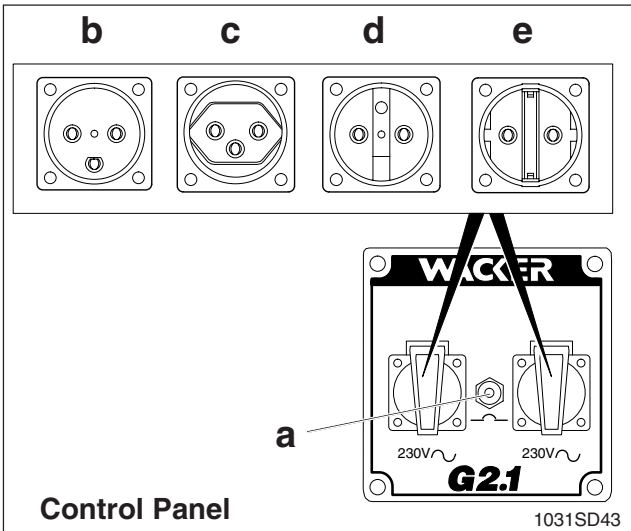
The generator is protected by a 10 amp circuit breaker **(a)** located on the control panel.

The circuit breaker protects the generator from severe overloads or short circuits. If the circuit breaker opens, turn the engine off immediately and determine the cause before restarting. Check the appliances and tools attached to the generator for defects and make sure their power requirements do not exceed the power rating of the generator.

When the circuit breaker opens, the breaker button will pop out. To reset circuit breaker, push button in.

Depending on model, the generator will have one of the four styles of receptacles, the Danish IP44 type **(b)**, the Swiss IP X4 type **(c)**, the France/Belgium IP44 type **(d),** or the Schuko IP44 (CEE 7) type **(e)**.

Note: *Enlargements of receptacles show protective covers removed for identification purposes only. Never remove protective covers.*



Control Panel

a Main circuit breaker - 10 Amp.
b Danish IP44 style receptacle.
c Swiss IP X4 style receptacle.
d France/Belgium IP44 style receptacle.
e Schuko IP44 (CEE 7) style receptacle.

4.7 Earth-leakage Circuit Breaker

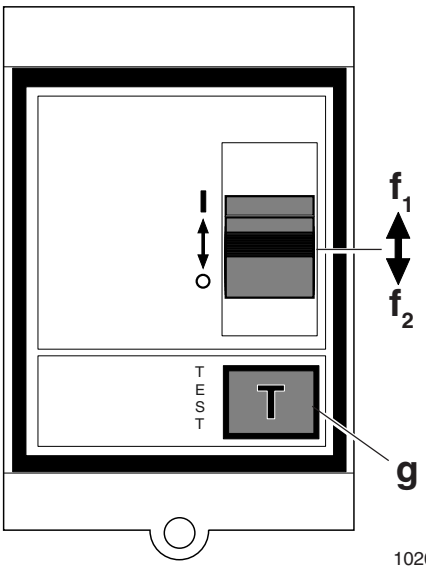
Generator model G2.1AE is equipped with an earth-leakage circuit breaker. The circuit breaker is current operated and shuts off the power to the receptacles when a ground fault of 30 milli-Amps or greater occurs in the generator or to a piece of equipment attached to the generator. The circuit breaker is located on the opposite side of the generator as the control panel.

The circuit breaker should be tested for proper operation every time the generator is used.

To test the earth-leakage circuit breaker:

Start the generator. Place main circuit breaker in closed position. Push in TEST button **(g)**. The circuit breaker lever will lower to the open position **(f_2)**. Power is now off at both receptacles. If the lever does not lower, the circuit breaker is not working. Do not use the generator until the problem can be corrected. To restore power to the receptacles, raise the circuit breaker lever to the closed position **(f_1)**.

If the circuit breaker lever lowers to the open position during operation, stop the generator and check it and equipment for defects. Repair all defects before operating generator.



4.8 Capacitors

WARNING

ALWAYS handle or test capacitors with the engine stopped. Extremely high voltage is present at the capacitor terminals while the generator is in use.

Although the capacitors used in this generator are designed to discharge when the engine is stopped, it is still a good idea to discharge them manually before handling. To discharge a capacitor, place a conductor, such as a screwdriver with an insulated handle, across the capacitor terminals. Be sure to touch only the insulated handle. This will short out across the terminals and discharge the capacitor.

Testing Capacitor

1. Discharge capacitor as described above, then disconnect all wire leads from the terminals.
2. Check the capacitor charge and discharge readings using an ohmmeter as described below or use a capacitor checker. See Figure 4-4.

   Set Ohmmeter on R x 10k scale.

   Set meter leads on capacitor terminals. The meter should deflect momentarily towards zero (fully discharged) and then slowly climb up to infinity (charging).

   Reverse meter leads and repeat procedure. Results should be the same.
3. If meter does not deflect torward zero, or deflects to zero and remains there, the capacitor is open or shorted and must be replaced.

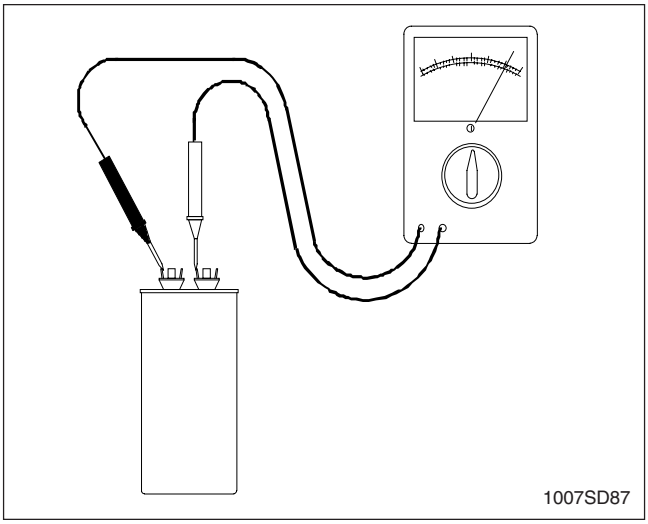


Figure 4-4. Testing Capacitor

4.9 Engine Speed

All generators require a fixed engine speed to maintain the correct voltage output. Engine speed is controlled by a governor which automatically adjusts to varying loads on the engine to maintain a constant speed of 3000 – 3100 rpm.

Testing Engine Speed

Measure the engine speed using a tachometer with no load applied to the generator. The engine must be running at 3100 ± 50 rpm. Voltage output is directly related to engine speed. A slow engine will reduce voltage. Refer to the Operator's Manual for engine speed adjustment.

The generator is designed to produce no output if engine rpm falls 10% or more below the required speed (approximately 2700 rpm).

Setting Engine Speed

Setting the engine speed requires the adjustment to the governor. See Figure 4-5.

To set the engine to the proper speed:

Turn the engine speed adjusting screw **(a)** in or out to obtain a **no-load** speed of 3100 rpm.

CAUTION: Setting the engine speed too high or too low may damage tools and other appliances attached to the generator.

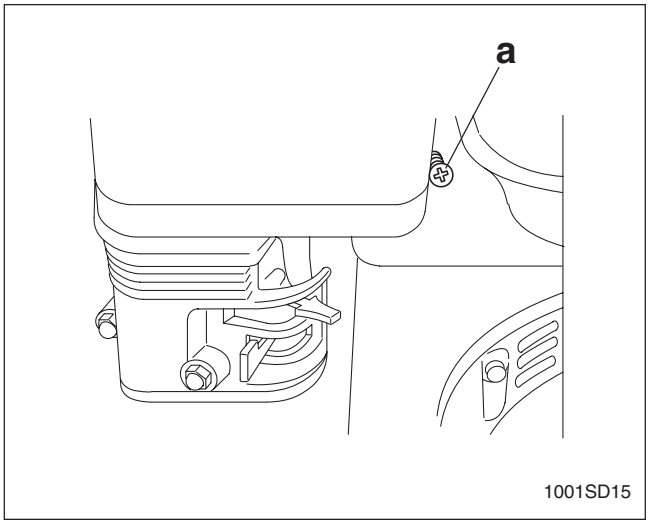


Figure 4-5. Engine Speed Adjusting Screw

4.10 Loss of Residual Magnetism in Rotor

If the rotor has been removed, or the generator has been stored over six months, the rotor's magnetism may be lost. Loss of magnetism will prevent the generator from building voltage.

WARNING

Contact with exposed connections inside the control box or while handling battery leads can cause severe electrical shocks. Be extremely careful to avoid touching any exposed connections. Never wear jewelry or use tools or metal items that may make contact across exposed connections. Review safety rules at beginning of this manual.

To restore magnetism to the rotor, "flash" it as follows:

1. Remove the two screws and the end cover. Locate the capacitor that is attached to the stator housing.
2. Run generator at normal no-load speed – 3100 rpm, auto-idle off.
3. **Briefly** touch a 12 VDC battery across the two capacitor connections to pulse the auxiliary winding. The leads should remain attached to capacitor. The polarity of the battery leads is not important.

   CAUTION: DO NOT hold battery leads on connection longer than two seconds.

   The output voltage should quickly come up to normal levels. Repeat if necessary. See Figure 4-6.
4. Stop engine and replace end cover.

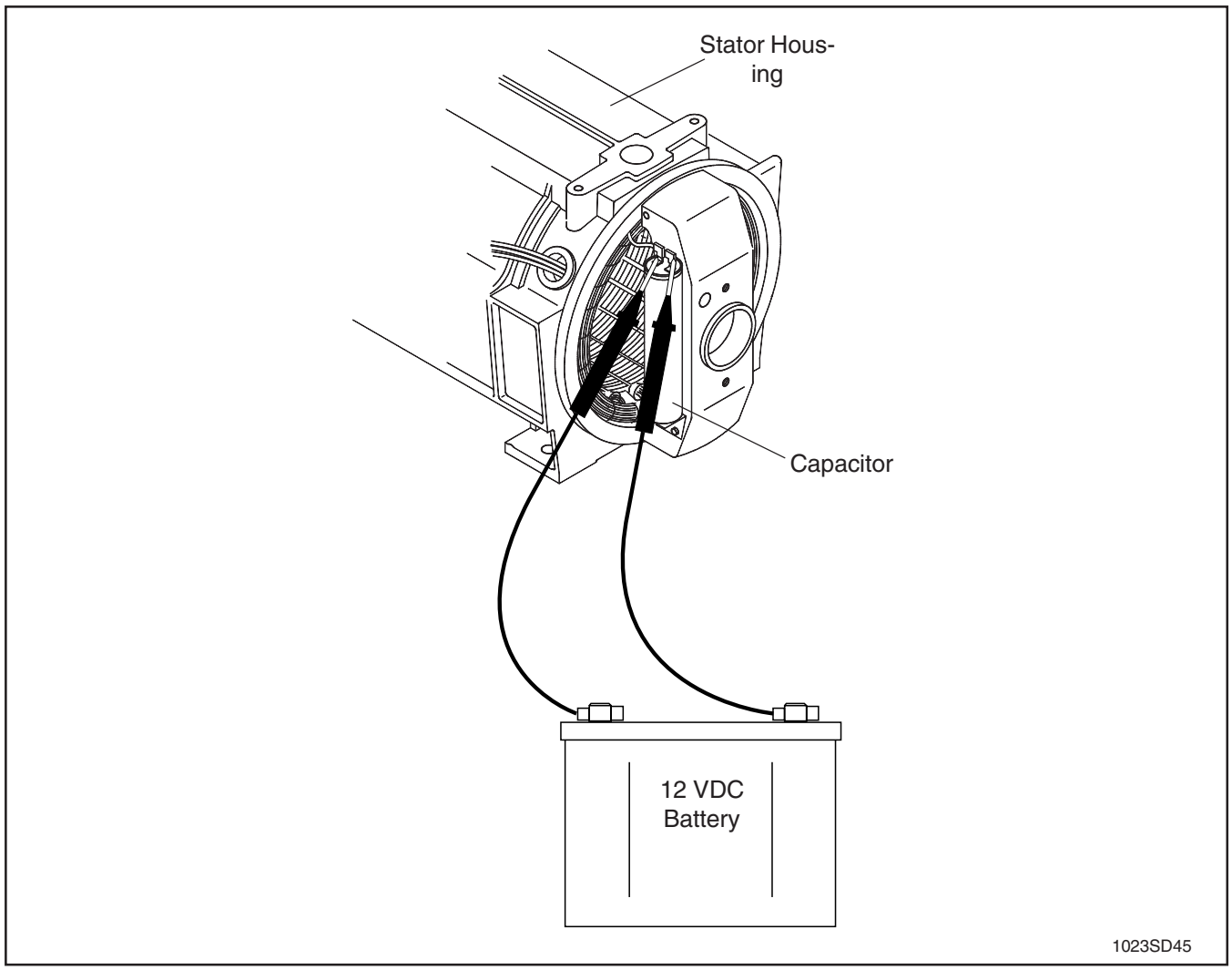


Figure 4-6. "Flashing" the Rotor

4.11 Receptacle Panel Wiring

Remove receptacle panel from control box and inspect the wiring for worn or loose wires. Make sure all wire connections are secure and tight at the screws. **DO NOT** allow wires to be pinched, kinked or damaged in any way. Inspect for tight connections at circuit breakers, capacitors, switches and receptacles. Replace any broken or damaged parts.

4.12 Rotor Diode Testing

To check diode:

1. Disassemble generator and remove rotor. See Section 4.15 *Generator Disassembly*.
2. Set ohmmeter in lowest scale. Test diode in forward position. Meter should read low or close to zero.
3. Reverse meter leads and test diode in reverse position. Meter should read high or close to infinity.

A zero reading in both directions indicates a shorted diode. A reading of Infinity in both directions indicates an open diode. The diode must be replaced in either case.

If one diode is defective it is recommended that both diodes be replaced since the remaining diode may have been weakened.

To remove diode, use a soldering iron to soften solder and remove wires.

When soldering on wires do not allow soldering iron to remain on diodes longer than 10 seconds or diode may be damaged.

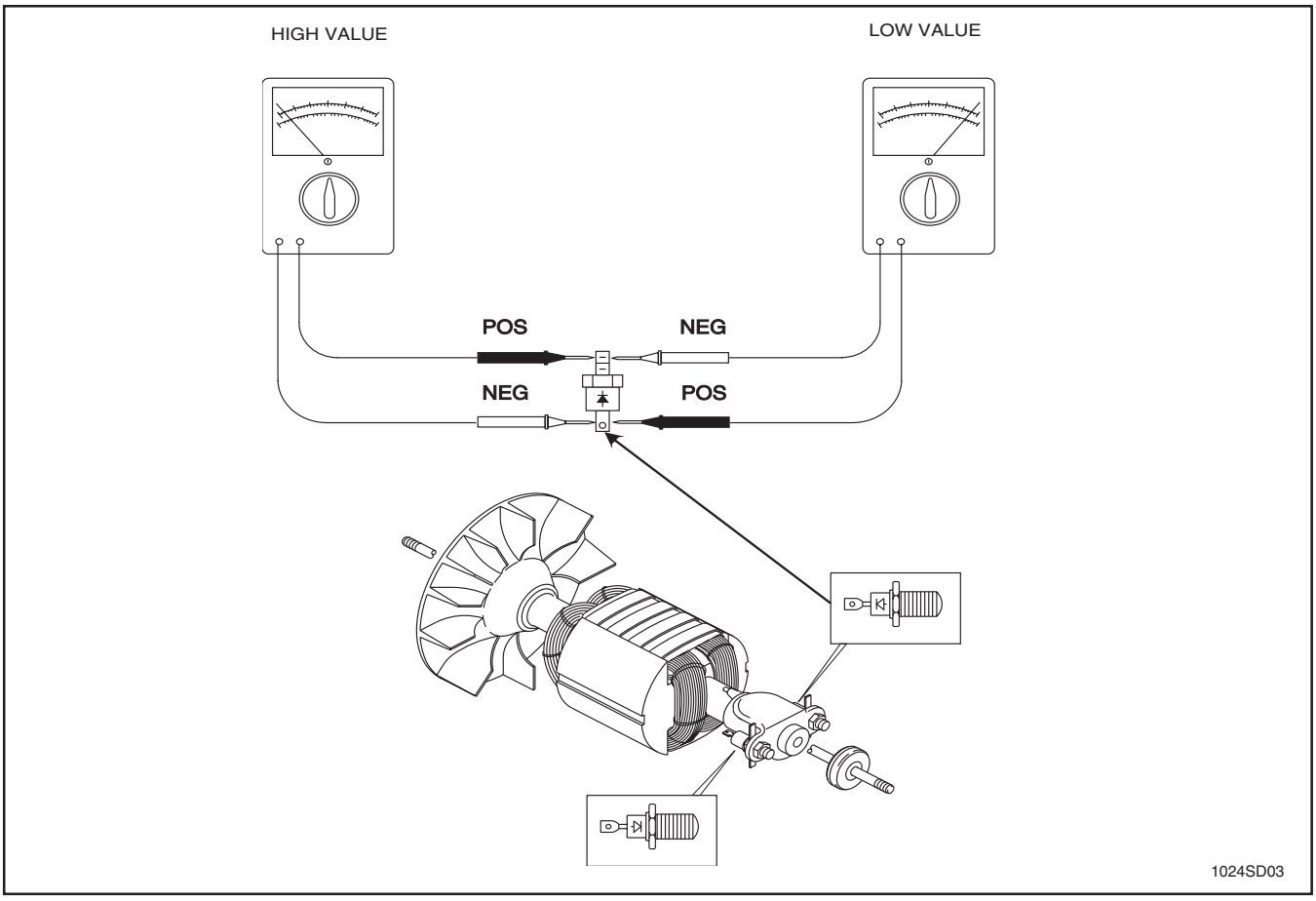


Figure 4-7. Rotor Diode Testing

4.13 Stator Winding Testing

The stator includes the main winding and the auxiliary winding.

To check stator windings:

1. Unplug stator connector at control box.
2. Disconnect ground wire.
3. Set ohmmeter to lowest scale. Place meter leads on connector terminals as shown and record resistance values, see Figure 4-8.

   Check resistance values with those listed on Table 4-1.

   A high or low reading indicates an open or shorted winding and the stator must be replaced.
4. Test for grounded windings by checking for continuity between winding and metal frame.

   If continuity exists, winding is grounded and stator assembly must be replaced.

   Note: *Make sure stator is completely disconnected from generator. The main winding is intentionally grounded to the generator to form a neutral and will give a false reading.*
5. Check for continuity between auxiliary winding and main winding. If continuity exists, the auxiliary winding has a short to the main winding and stator must be replaced.
6. Test the auxilliary windings by disconnecting themfrom the capacitor and taking a resistance reading. Reading should compare with the value in Table 4-1.

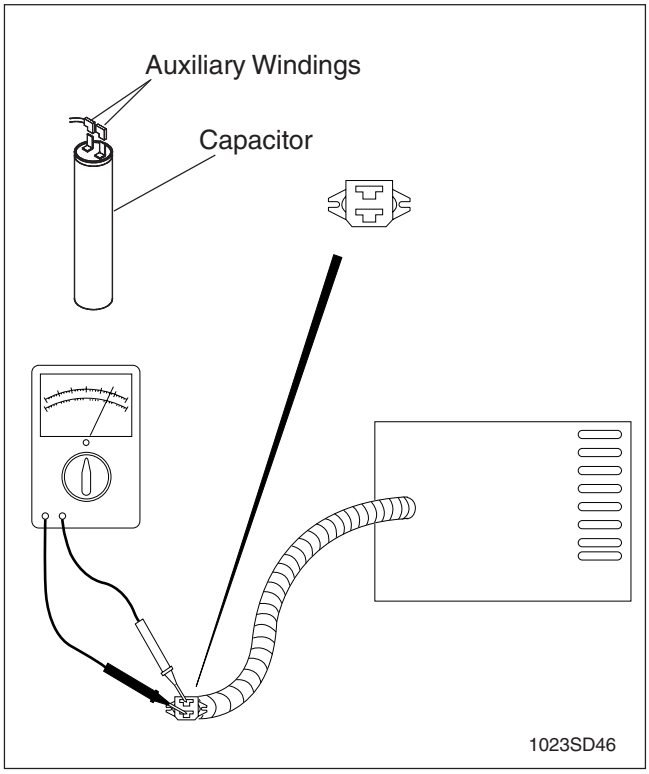


Figure 4-8. Stator Winding Testing

Table 4-1.
Resistance Values (Ohms)

Main Winding	Auxiliary Winding	Rotor Winding
0,918	1,04	8,12

Resistance values are very small and require a good quality meter with the ability to be zeroed out. A poor quality meter may not provide accurate readings.

All resistance values are approximate.

4.14 Rotor Winding Testing

Before testing rotor, visually inspect windings for dark streaks which indicate a burned or shorted winding. Rotate ball bearing by hand. Replace it if it is rough or noisy.

To check rotor:

1. Remove end cover, locknut, stator and rotor from generator. See Section 4.15 *Generator Disassembly*.
2. Unsolder wires from diodes, being careful not to break wires.
3. Measure rotor resistance as shown in Figure 4-9.
4. Record resistance values of both windings and compare them with values listed in Table 4-1.
5. Check for grounded windings by holding one meter lead to winding and other lead to metal frame on rotor.

Replace rotor if windings are open, shorted internally or shorted to metal frame.

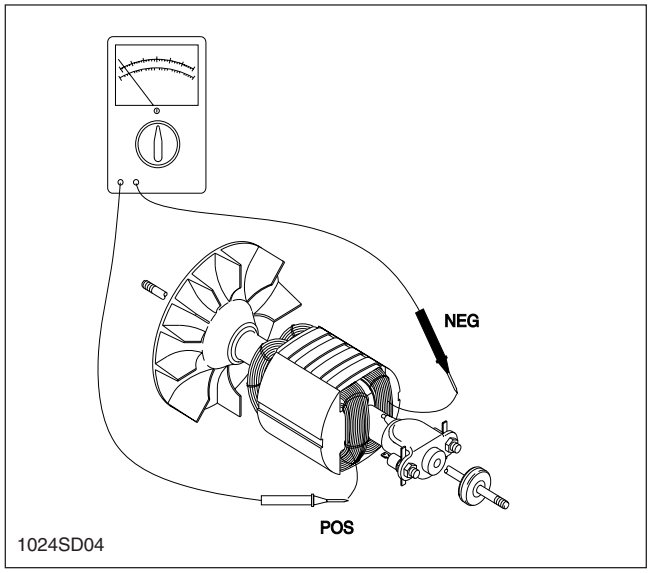


Figure 4-9. Rotor Winding Testing

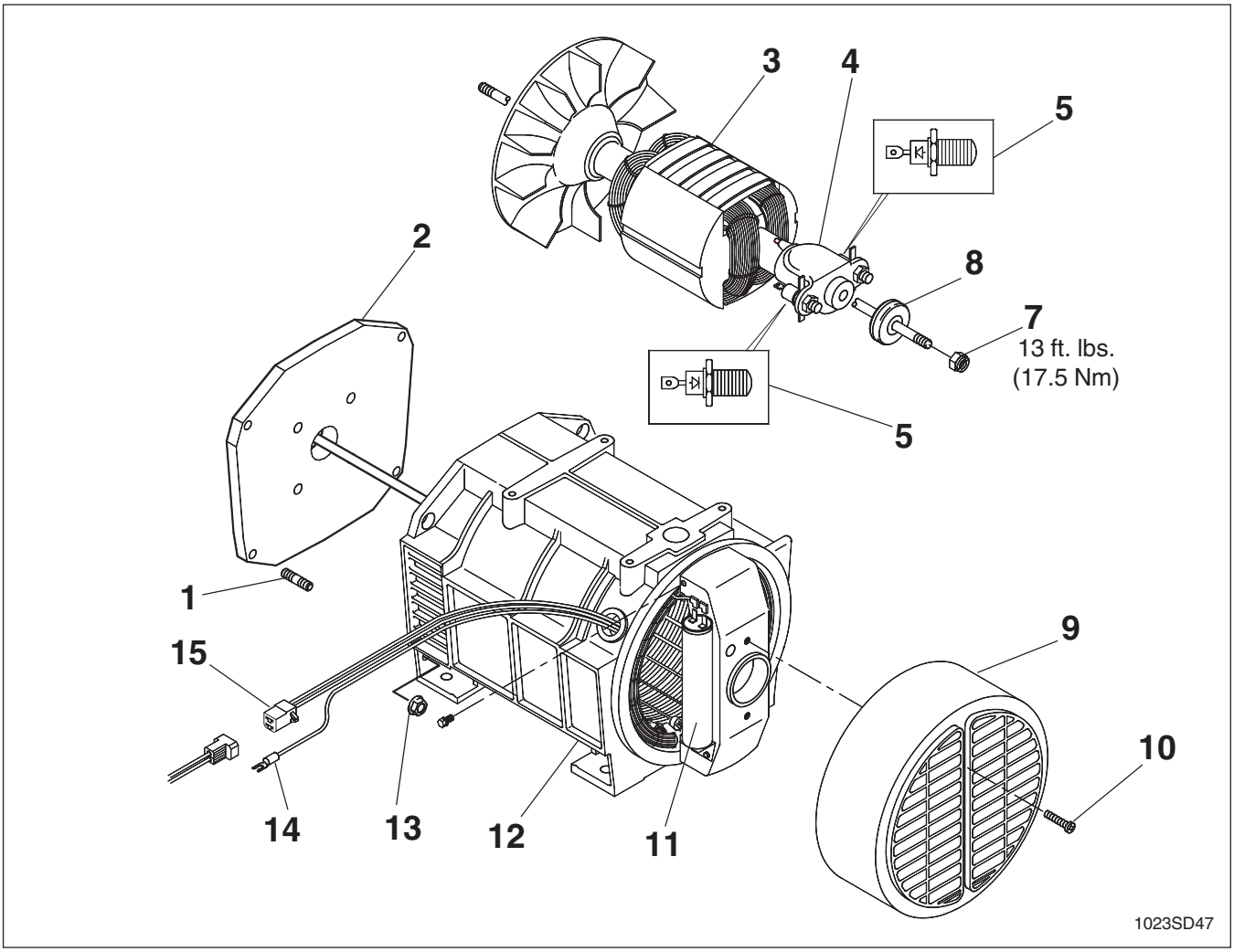


Figure 4-10. Brushless Generator

4.15 Generator Disassembly

Capacitor

1. Remove the two end cover screws **(10)** and the end cover **(9)**. See Figure 4-10.
2. Disconnect the leads from the capacitor **(11)**, cut the nylon tie wrap, and remove the capacitor mounting screw.

Stator

1. Remove the control panel, unscrew the ground wire **(14)** and unplug the stator wire **(15)** from the back of the panel. See Figure 4-10.
2. Remove the shaft securing nut **(7)**.
3. Remove the four nuts **(13)** securing the generator frame **(12)** to the engine adapter flange.
4. Remove the two bolts and nuts that secure the stator **(12)** to the shock mount bracket.
5. With a block of wood and a mallet, tap stator frame away from the engine. Withdraw stator frame assembly **(12)** over the rotor **(3)** carefully to avoid damage to windings in the stator or rotor.

Note: *If the rotor comes out with the stator, skip step 6.*

6. Support the rotor weight with a sling or place a block between the rotor and base.

Rotor

Rotor **(3)** removed with stator:

1. Place stator on flat surface with bearing **(8)** end up. Elevate the stator **(12)** by placing two blocks of wood on the edge of the stator frame to allow the rotor to drop. See Figure 4-10.
2. Partially screw one of the frame mounting bolts into the bearing and tap screw with a mallet. The rotor should drop out of the stator.

Rotor **(3)** still attached to the engine:

1. Remove stator per instructions above.
2. Release the rotor **(3)** from the engine shaft by supporting rotor in one hand and with a mallet, striking firmly on a pole face.

Diode and/or Varistor

1. Unsolder leads from the diodes **(5)** and **(8)** and unscrew diode stud. See Figure 4-10.
2. Unsolder varistor lead from the solder tag on the diode stud.
3. Remove the silicon sealant supporting the varistor from the diode bracket **(4)**.

4.16 Generator Assembly

When assembling the generator be sure to observe the following:

1. Install diodes **(5)** to the diode bracket **(4)** assembly on the rotor, by placing the solder tags on the diode stud and tighten to the diode base. See Figure 4-10.
2. Insert varistor leads first, and push varistor well down into the diode bracket assembly recess. Solder leads to the diode pin and the solder tag on the diode stud. Reseal varistor with silicon sealant.
3. Make sure inner taper on rotor and outer taper on the engine crankshaft are clean and free of rust and oil.
4. Install the rotor **(3)** on crankshaft.
5. Slide stator **(12)** over the rotor carefully to avoid hitting and damaging windings. Tap the frame onto the rotor bearing.
6. Attach the four nuts **(13)** to secure frame to the engine adapter flange.
7. Install the shaft securing nut **(7)**. Tighten to 13 ft. lbs. (17.5 Nm).
8. Install the capacitor **(11)** using the mounting screw and a new nylon tie wrap. Re-attach the two leads.
9. Install the end cover **(9)** and two mounting screws **(10)**.
10. Reconnect the ground wire **(14)** and the stator wire **(15)** to the control panel, and reinstall panel.

4.17 Troubleshooting

Table 4-2.
Generator Chart

Symptom	Possible Cause	Solution
Engine Does Not Start	1. Engine switch is in “OFF” position.	1. Move engine switch to “START” position.
	2. Fuel valves under fuel tank and on engine are closed.	2. Open fuel valves.
	3. Fuel tank is empty.	3. Fill fuel tank.
	4. Choke lever is in wrong position.	4. Move choke lever to correct position. (Close choke lever when starting a cold engine).
	5. Spark plug is in poor condition.	5. Replace spark plug.
	6. Spark plug cap is loose.	6. Tighten spark plug cap.
	7. Engine oil level is low.	7. Refill oil.
No Output Voltage	1. Engine speed too slow.	1. Increase engine speed to 3100 rpm, no-load. (See section 4.9)
	2. Circuit breaker open.	2. Reset breaker.
	3. GFI open.	3. Test and reset ELCB. Replace if defective. Tool or appliance defective, leaking current. (See section 4.7)
	4. Loss of residual magnetism.	4. Flash rotor fields. (See section 4.10)
	5. Defective receptacle or switch.	5. Inspect wiring and components and repair. (See section 4.11)
	6. Rotor diodes open or shorted.	6. Test diodes and replace. (See section 4.12)
	7. Open or shorted stator windings.	7. Test stator and replace. (See section 4.13)
	8. Open or shorted rotor windings.	8. Test rotor and replace. (See section 4.14)
	9. Connector from generator to control panel is loose or disconnected.	9. Install tightly.
Low Voltage	1. No-load voltage between 140 – 200 volts, engine operating at correct speed.	1. One diode on rotor open or shorted. Replace all diodes. (See section 4.12)
	2. Engine slightly below operating speed, but not enough to collapse all output.	2. Increase engine speed to 3100 rpm, no-load. (See section 4.9)
	3. Capacitor is defective.	3. Test capacitor and replace if necessary. (See section 4.8)
	4. Rotor winding wire broken off at diode.	4. Resolder wire to diode.
	5. Rotor winding partially shorted.	5. Test rotor winding resistance. Replace rotor. (See section 4.14)
	6. Rotor slipping on engine crankshaft.	6. Rotor winding partially shorted.
High Voltage	1. Engine speed too high.	1. Reduce engine speed to 3100 rpm, no-load. (See section 4.9)
No-load Voltage Normal but Falls when Load is Applied	1. Engine lugging down under load.	1. Refer to engine repair manual to restore engine power.

4.18 Periodic Maintenance Schedule

	Daily Before Starting	Every 3 months or 50 hours	Every 6 months or 100 hours	Every year or 300 hours	Every year or 500 hours
Check engine oil. Fill to correct level.	•				
Check air cleaner.	•				
Clean air cleaner.*		•			
Change engine oil.			•		
Check sediment cup at carburetor.			•		
Clean and adjust spark plug.			•		
Clean spark arrester (optional accessory).			•		
Check shockmounts. Replace when necessary.			•		
Check and adjust valve clearance.*				•	
Clean fuel tank.*				•	
Check condition of fuel line. Replace when necessary.	•			•	

* Service more frequently in dusty conditions.

Table 4-3.

Engine Service

Normal servicing of the engine such as cleaning the air cleaner, sediment cup, carburetor adjustments, auto idle speed and engine speed can be located in the Operator's manual. In depth engine service should be performed by qualified personnel or by the nearest Honda dealer.

4.19 Storing/Transporting

Before storing generator for a long period of time:

1. Close the fuel valve and remove and empty sediment cup under carburetor.
2. Disconnect the fuel line from the carburetor. Place open end of fuel line into a suitable container and open fuel valve to drain fuel from tank.

WARNING

Gasoline is extremely flammable. Drain fuel tank in a well-ventilated area. **DO NOT** drain tank in an area with flames or sparks.

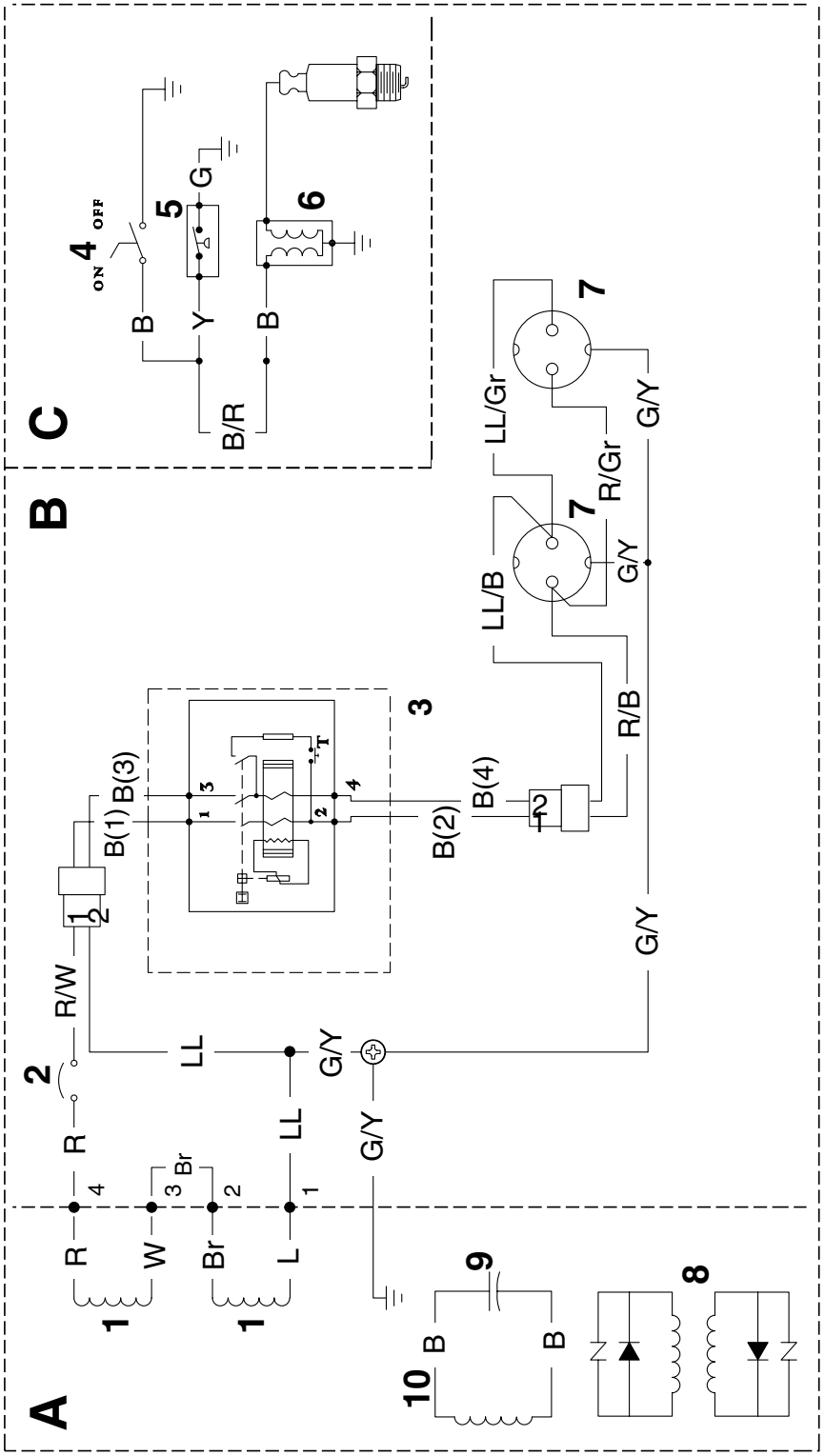
3. Loosen the drain screw on the carburetor and drain any remaining fuel from carburetor.
4. Change the engine oil.
5. Remove the spark plug and pour approximately one tablespoon (1 ounce) of clean engine oil into the cylinder. Crank the engine a few turns to distribute the oil to the inside of the cylinder walls.
6. Pull the starter rope slowly until resistance is felt and leave handle in this position. This ensures that the intake and exhaust valves are closed.
7. Store generator in a clean, dry area.

WARNING

To avoid burns or fire hazards, let engine cool before transporting generator or storing indoors.

Turn the fuel valves under the tank and on engine to the off position and keep the engine level to prevent fuel from spilling.

4.20 Wiring Schematic (G2.5A Model)



A = Generator
B = Control box
C = Engine

1 = Main stator winding
2 = Main circuit breaker
3 = Earth-leakage circuit breaker (G2.1AE only)
4 = Ignition switch
5 = Oil level switch
6 = Coil
7 = 16 Amp receptacle
8 = Rotor winding
9 = Capacitor (25µF)
10 = Auxiliary winding

Wire Colors

B - Black	W- White
G - Green	Y - Yellow
L - Blue	Br - Brown
P - Pink	Gr - Gray
R - Red	Or - Orange
LL-Light blue	Pr - Purple
	T - Tan

1020SD79

5.1 Theory of Operation – Brush Generators

Basic Generator Theory

These generator models use a brush/slip ring design to generate and regulate power and consist of a rotor, stator, diode bridge, and an auxiliary winding. They also incorporate a choke that is connected in series with the auxiliary winding. The choke's purpose is to bring the current in the auxiliary winding "in phase" with the main windings. The current from the auxiliary winding is carried to the rotor via the brushes and slip rings.

The generators also contain an Automatic Voltage Regulator (AVR) that maintains a specific voltage output regardless of load. The voltage regulator accomplishes this by regulating DC current from the auxiliary winding. When the load on the generator increases, the voltage regulator allows additional DC current into the main rotor. The additional DC current allows the generator to increase output and maintain the desired output voltage.

These models are designed to operate with close regulation when supplying single phase loads. The principle of operation is schematically represented in Figure 5-1, and a cross-sectional view in Figure 5-2. The auxiliary winding **(a)** provides excitation power through a choke **(b)** and bridge rectifier **(c)** into the rotor winding **(d)** via slip rings and brushes. The AVR **(e)** diverts excess excitation to maintain the stator winding **(f)** output voltage within close limits. The main stator winding is designed for series/parallel connection to give a dual voltage output.

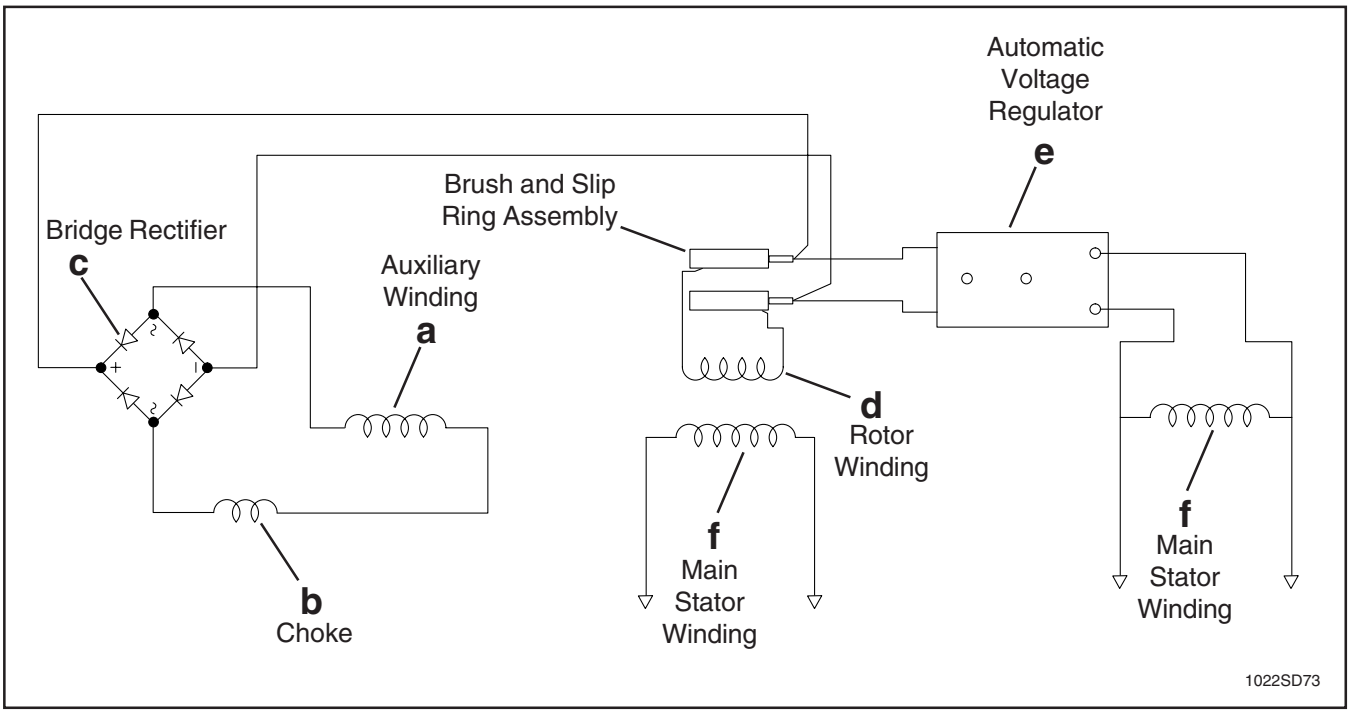


Figure 5-1. Principle of Operation Schematic

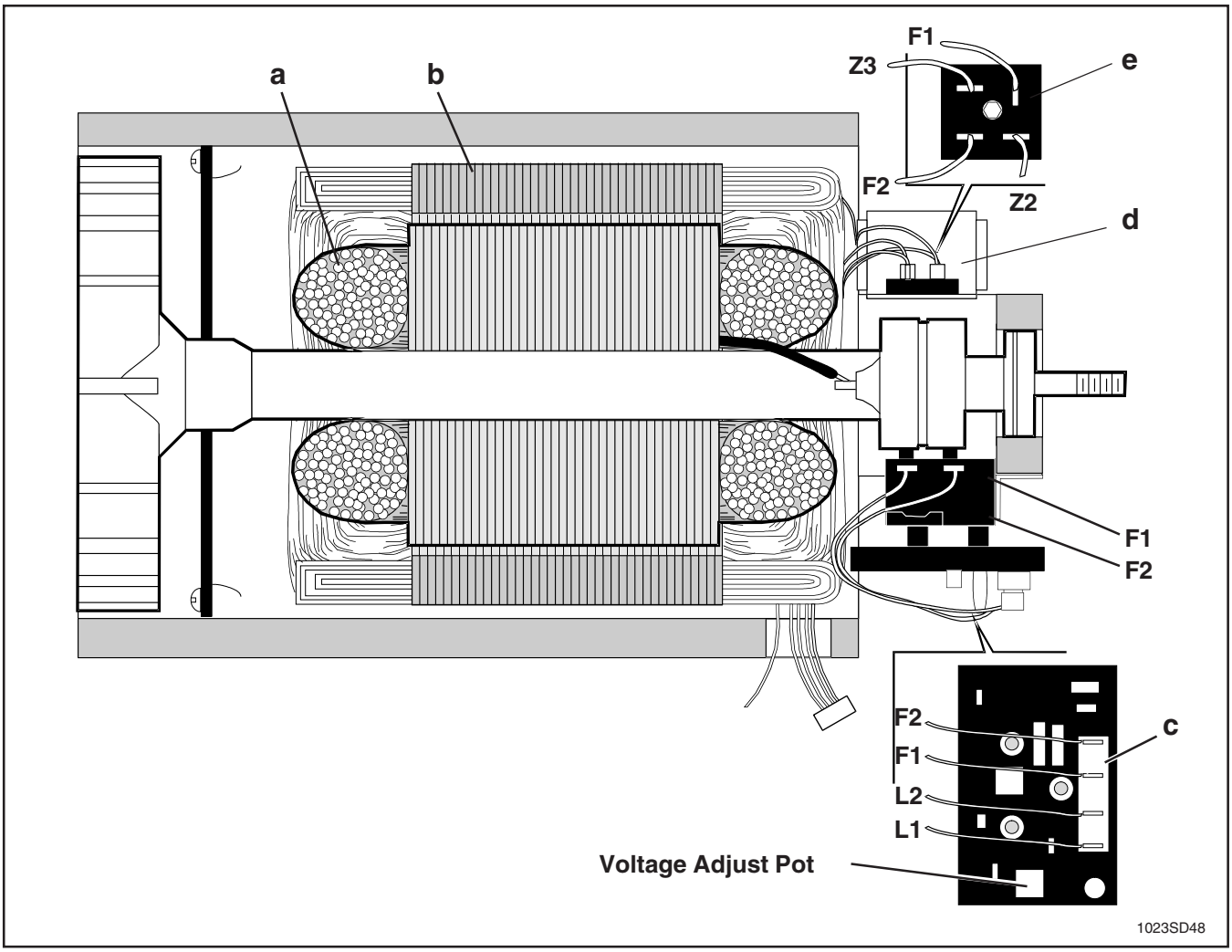


Figure 5-2. Brush-Type Generator

5.2 Rotor

The inside of the rotor shaft is tapered and connected directly to the taper on the engine crankshaft. This end is supported by the engine crankshaft bearing. The opposite end of the rotor is supported by a bearing housed in the generator housing. This end also contains the two slip rings. There are two individual coils wound on the rotor **(a)**. When the engine is running, these two windings create the magnetic field for the main stator windings.

5.3 Stator

The stator **(b)** houses both the main windings and auxiliary winding. The main windings are connected directly to the main circuit breaker and voltage selector switch to supply power to the output receptacles. The auxiliary winding induces the initial current in the field windings of the rotor. It is connected directly to the choke and the AC input to the bridge rectifier.

5.4 Automatic Voltage Regulator (AVR)

The Automatic Voltage Regulator (AVR) **(c)** provides the generator with a means of maintaining a specific voltage regardless of load. The AVR accomplishes this by regulating DC current from the auxiliary winding. When the load on the generator increases, the AVR allows additional DC current into the rotor. The additional DC voltage allows the generator to increase output and maintain voltage.

5.5 Choke

The purpose of the choke **(d)** is to bring the auxiliary winding “in phase” with the main windings.

5.6 Bridge Rectifier

The bridge rectifier **(e)** is located on the stator housing and is placed in a cooling air flow of the rotor. This bridge rectifier forms a full wave rectifier to convert induced AC current in the auxilliary winding to DC current.

5.7 Main Circuit Breaker

The circuit breaker protects the generator from severe overloads or short circuits. If the circuit breaker opens, turn the engine off immediately and determine the cause before restarting. Check the appliances and tools attached to the generator for defects and make sure their power requirements do not exceed the power rating of the generator or the current limit of the receptacles.

When the circuit breaker opens, the breaker lever will snap down. To reset the circuit breaker, lift lever up. See Figures 5-5 and 5-6.

5.8 Earth-leakage Circuit Breaker

Generator models G3.3AE, G4.6AE, GS4.6AE, and GS5.7AE are equipped with an earth-leakage circuit breaker. The circuit breaker is current-operated and shuts off the power to the receptacles when a ground fault of 30 milli-Amps or greater occurs in the generator or to a piece of equipment attached to the generator. The circuit breaker is located on the control panel and should be tested for proper operation every time the generator is used.

To test the earth-leakage circuit breaker:

Start the generator. Place main circuit breaker in closed position. Push the TEST button **(g)** on the circuit breaker. The circuit breaker lever will lower to the open position **(a_2)**. Power is now off at both receptacles. If the lever does not lower, the circuit breaker is not working. Do not use the generator until the problem can be corrected. To restore power to the receptacles, raise the circuit breaker lever to the closed position **(a_1)**.

If the circuit breaker lever lowers to the open position during operation, stop the generator and check it and equipment for defects. Repair all defects before operating generator.

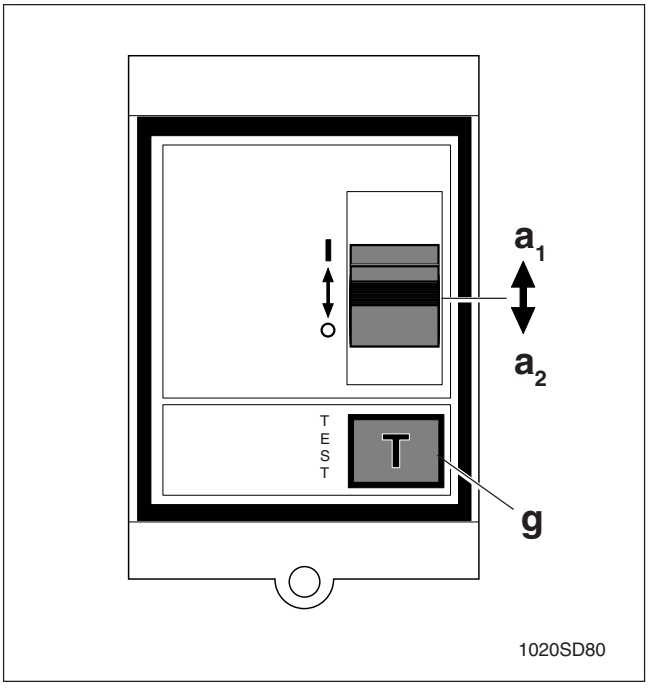


Figure 5-4a. ELCB for G3.3AE, G4.6AE, and GS4.6AE Models

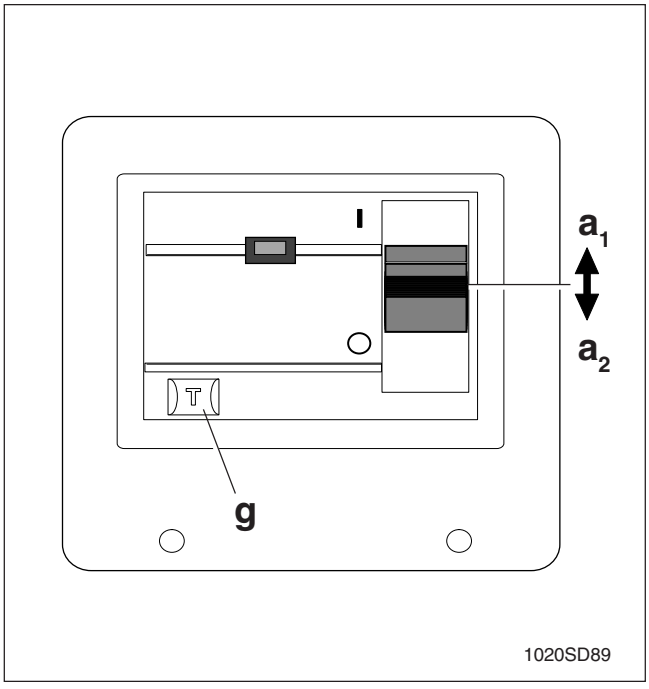
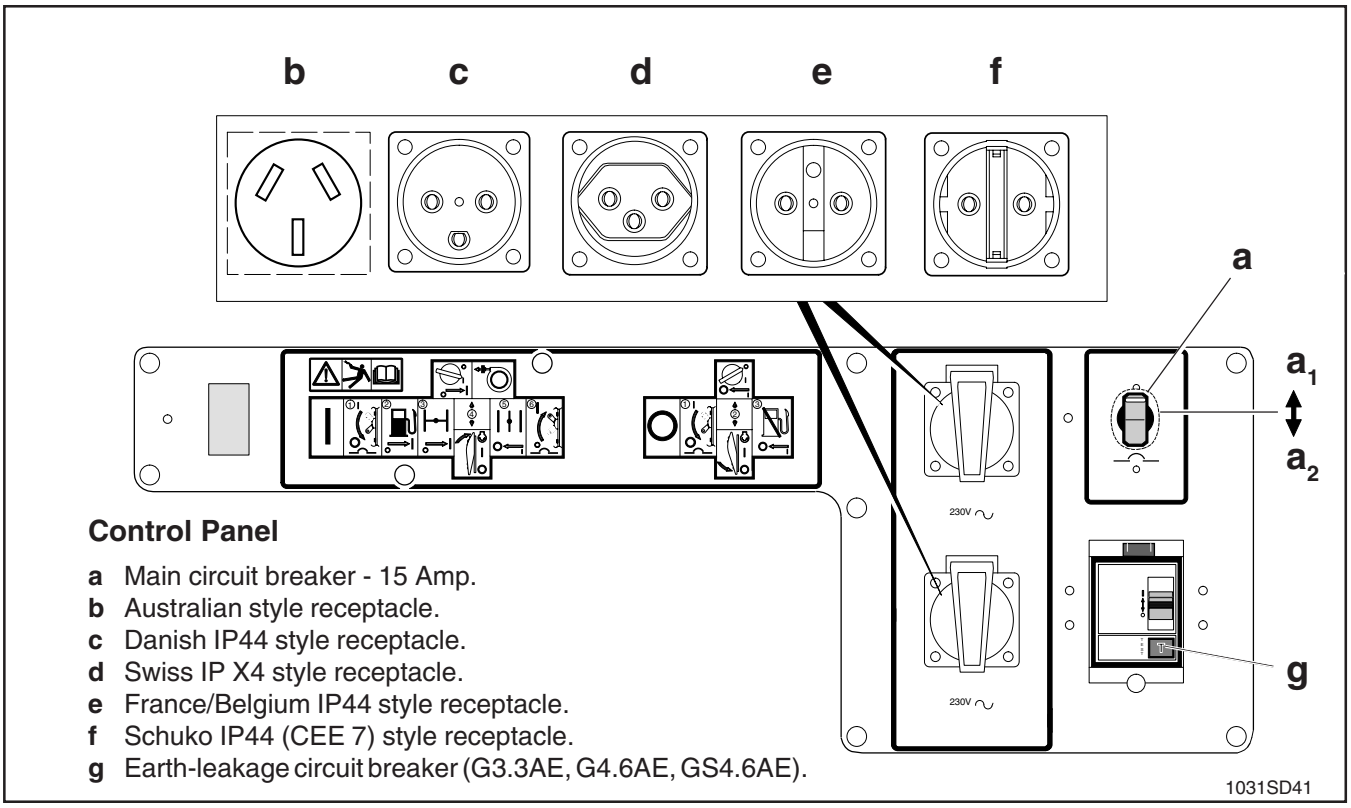


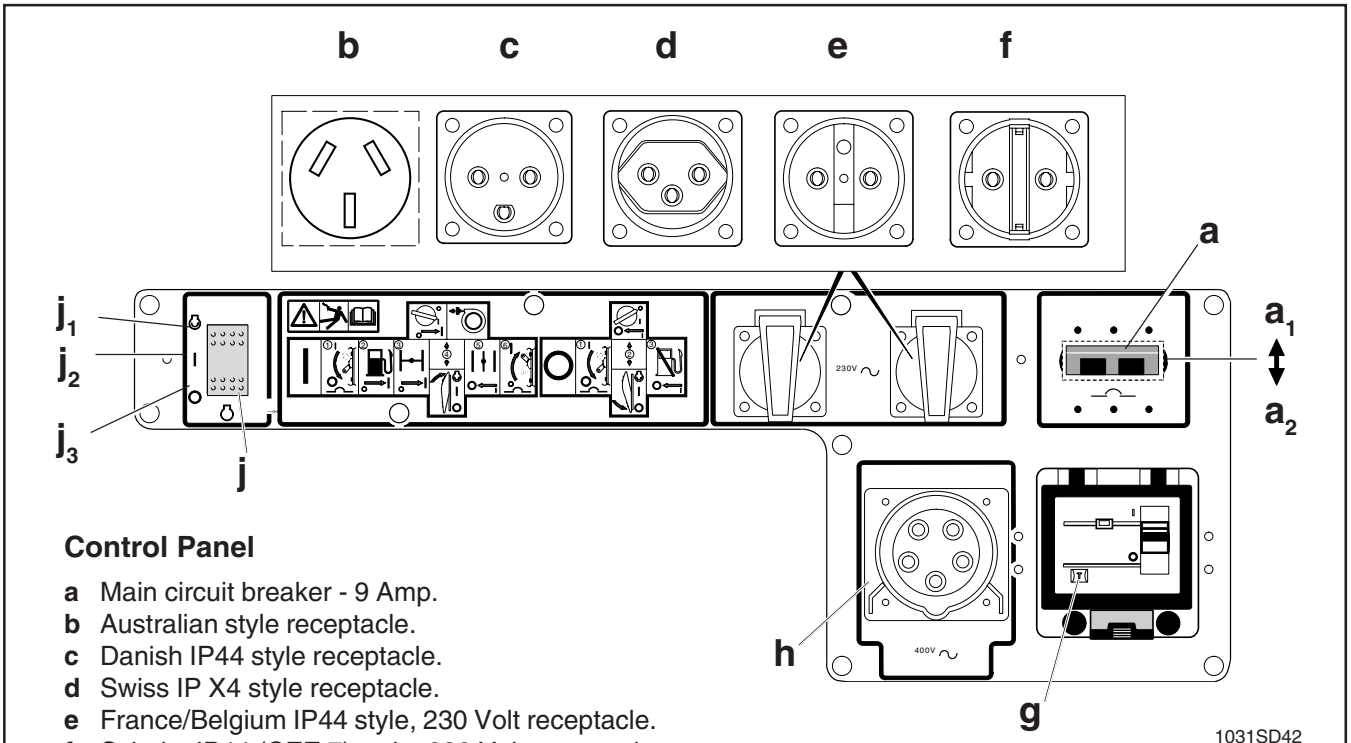
Figure 5-4b. ELCB for GS5.7AE Models



Control Panel

- **a** Main circuit breaker - 15 Amp.
- **b** Australian style receptacle.
- **c** Danish IP44 style receptacle.
- **d** Swiss IP X4 style receptacle.
- **e** France/Belgium IP44 style receptacle.
- **f** Schuko IP44 (CEE 7) style receptacle.
- **g** Earth-leakage circuit breaker (G3.3AE, G4.6AE, GS4.6AE).

Figure 5-5. Control Panel (G3.3A, G4.6A, and GS4.6A Models)



Control Panel

- **a** Main circuit breaker - 9 Amp.
- **b** Australian style receptacle.
- **c** Danish IP44 style receptacle.
- **d** Swiss IP X4 style receptacle.
- **e** France/Belgium IP44 style, 230 Volt receptacle.
- **f** Schuko IP44 (CEE 7) style, 230 Volt receptacle.
- **g** Earth-leakage circuit breaker (GS5.7AE).
- **h** 3 Phase/400 volt (CEE 17, 3P+N+E, IP44)receptacle.
- **j** Engine crank switch.

Figure 5-6. Control Panel (GS5.7A Models)

5.9 Engine Speed (G3.3A, G5.7A, and GS5.7A Models)

Generators require a fixed engine speed to maintain the correct voltage. Engine speed is controlled by a governor which automatically adjusts to varying loads on the engine to maintain a constant speed of 3600 rpm. There is no throttle control.

To set the engine to the proper speed:

Turn the speed adjusting screw **(k)** in or out to obtain a **no-load** speed of 3100 rpm. See Figure 5-7.

CAUTION: Setting the engine speed too high or too low may damage tools and other appliances attached to the generator.

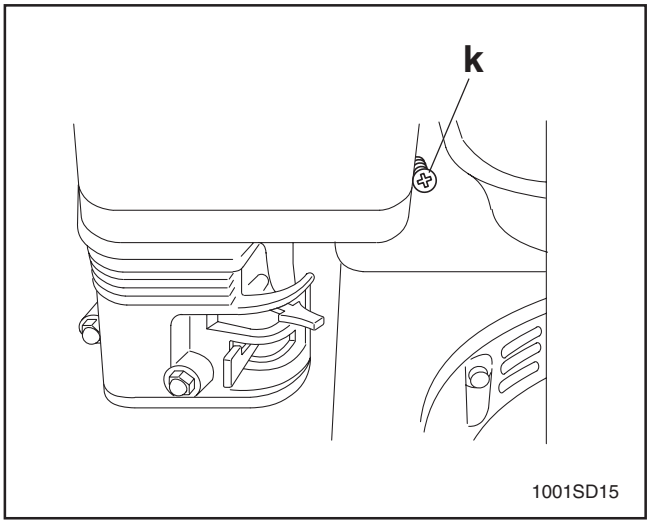


Figure 5-7. Engine Speed Adjusting Screw

5.10 Periodic Maintenance Schedule (G3.7A, G5.6A, and GS5.6A Models)

	Daily Before Starting	Every 3 months or 50 hours	Every 6 months or 100 hours	Every year or 300 hours	Every year or 500 hours
Check engine oil. Fill to correct level.	•				
Check air cleaner.	•				
Clean air cleaner.*		•			
Change engine oil.			•		
Check sediment cup at carburetor.			•		
Clean and adjust spark plug.			•		
Clean spark arrester (optional accessory).			•		
Check shockmounts. Replace when necessary.			•		
Check and adjust valve clearance.*				•	
Clean fuel tank.*				•	
Check condition of fuel line. Replace when necessary.				•	
Check condition of brushes** and slip rings for G3.7A, G5.6A and GS5.6A Models					•

* Service more frequently in dusty conditions.
** Brushes should not be less than 8mm long.

Table 5-3

Engine Service (G3.7A, G5.6A, and GS5.6A Models)

Normal servicing of the engine such as cleaning the air cleaner, sediment cup, carburetor adjustments, auto idle speed and engine speed can be located in the Operator's manual. In depth engine service should be performed by qualified personnel or by the nearest Honda dealer.

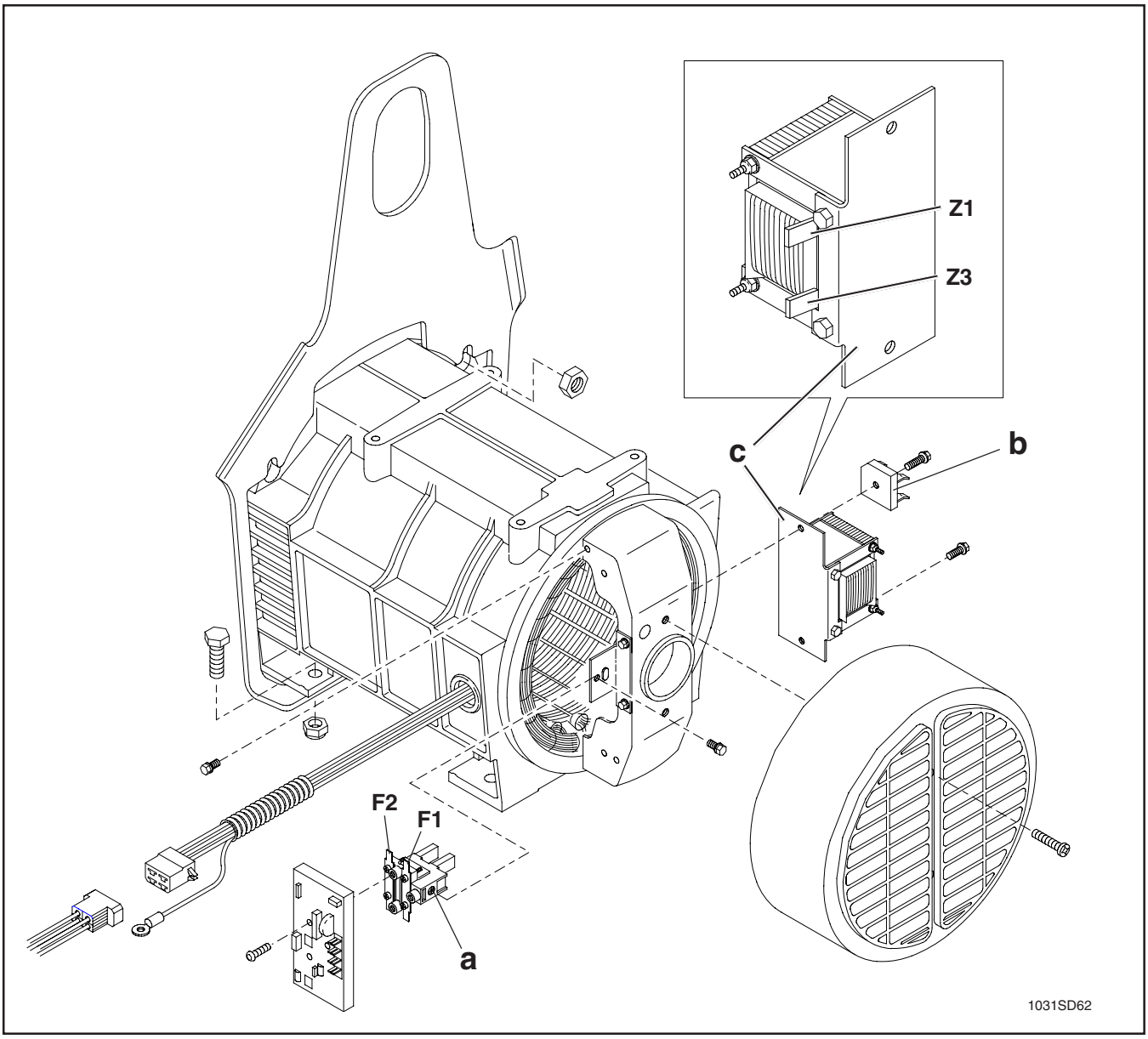


Figure 5-11. Brush Type Generator

5.11 Loss of Residual Magnetism in Rotor

General

If the rotor has been removed, the generator stored for a considerable time, or the rotor (field) connections reversed during service, the residual magnetism may have been destroyed. Loss of magnetism will prevent the generator from building voltage.

To check residual voltage, run the generator at normal no-load speed and measure the voltage at 120 VAC receptacles. This voltage should be at least 1.5 volts. If the voltage is less than 1.5 volts, the residual magnetism must be restored by “flashing” with a 12 volt battery.

Restoring Residual Magnetism to the Brush Type Generators

Disconnect leads F1 and F2 from the brush holder **(a)**. Run the generator at its normal speed and apply 12 volts from a battery to the brush holder for approximately 3 seconds. Ensure the positive lead is applied to the brush holder nearest the bearing housing. The output voltage of the generator, with the 12 volt supply connected, should be approximately normal voltage. See Figure 5-12.

Stop the generator and reconnect leads F1 – F2.

CAUTION: Ensure the battery leads are connected to the brush holder with the correct polarity, and leads F1 – F2 are isolated from each other and earth. Loss of residual magnetism will result if leads touch ground, each other, or wrong polarity.

5.12 Testing the Bridge Rectifier

Accessing the Bridge Rectifier

1. Remove the generator cover.
2. Remove leads Z2 and Z3 from the bridge rectifier **(b)**, and leads F1 and F2 that go to the brush assembly.

Checking Bridge Rectifier

To check the rectifier, follow these steps:

1. Set multi-meter on R x 1000 range.
2. Remove all wires connected to the rectifier.
3. Place the meter probes on two adjacent rectifier terminals and check resistance value. See Figure 5-13.
4. Reverse the probes and recheck.
5. The meter should indicate low resistance in one direction and a high resistance in the other direction.
6. Repeat this procedure for each adjacent set of terminals on the rectifier until all four diodes have been checked.

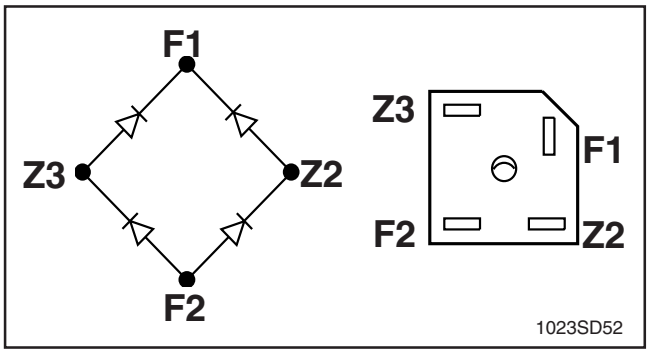


Figure 5-12. Diode Bridge

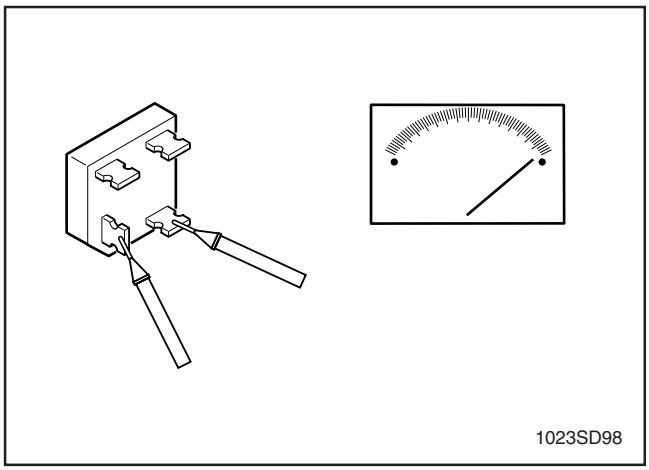


Figure 5-13. Checking Diode Bridge

5.13 Testing the Choke

To test the choke remove wires Z1 and Z3 from the choke **(c)** and the choke assembly. The resistance value of the choke should be 7.5 ohms.

5.14 Stator Windings

The stator includes the two main power windings and the auxiliary winding. See Figure 5-14.

To check stator windings:

1. Unplug stator connector at control box.
2. Set ohmmeter to lowest scale. Place meter leads on connector terminals as shown and record resistance values.

   Check resistance values with those listed on Table 5-1.

   A high or low reading indicates an open or shorted winding and the stator must be replaced.
3. Test for grounded windings by checking for continuity between winding and metal frame.

   If continuity exists, winding is grounded and stator assembly must be replaced.

   Note: *Make sure stator is completely disconnected from generator. The main windings are intentionally grounded to the generator to form a neutral and will give a false reading.*
4. Check for continuity between auxiliary winding and main windings. If continuity exists, the auxiliary winding has made contact with the main winding and stator must be replaced.

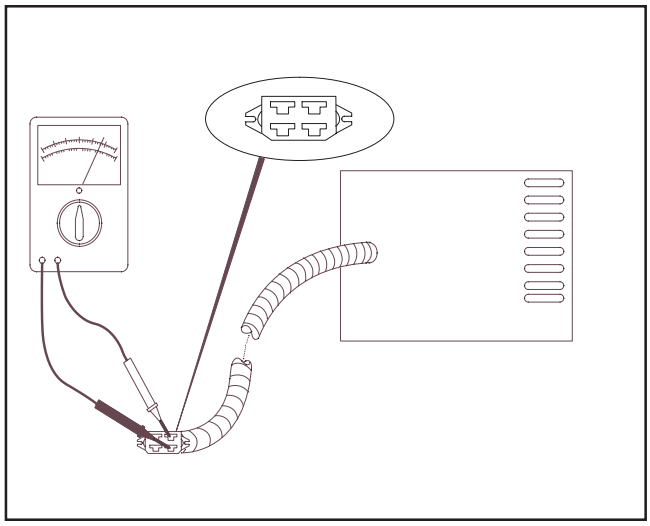


Figure 5-14. Checking Stator

Table 5-1.
Resistance Values

Generator Model	Main Winding (per section)	Auxiliary Winding	Rotor Winding
G3.3A	0.45	2.09	10.8
G4.6A	0.39	1.97	11.3
GS4.6A	0.39	1.97	11.3
GS5.7V	1.72	–	11.3

Resistance values are very small and require a good quality meter with the ability to be zeroed out. Using a poor quality meter may not provide accurate readings.

All figures are approximate values in ohms.

5.15 Rotor Windings

Before testing rotor, visually inspect windings for dark streaks which indicate a burned or shorted winding. Rotate ball bearing by hand. Replace it if it is rough, noisy or dry.

Checking Rotor

1. Remove end cover and brush assembly.
2. Measure resistance as shown in the illustration, by measuring the winding at the slip rings. See Figure 5-15.
3. Record resistance values of both windings and compare them with values listed in Table 5-1.
4. Check for grounded windings by holding one meter lead to winding and other lead to metal frame on rotor.

Replace rotor if windings are open, shorted internally or shorted to metal frame.

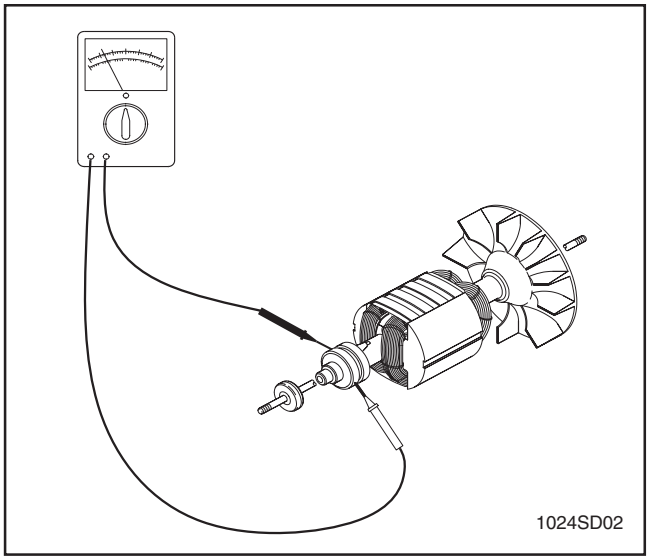


Figure 5-15. Checking Rotor

5.16 Slip Rings and Brushes

Slip Rings

Inspect the slip rings for dirt or damage. If the slip rings are dirty, use an eraser or non-metallic abrasive pad to clean the rings and then retry the generator.

Brushes

Inspect the brushes for damage, dirt, freedom of movement, or brush length. Brushes less than 8 mm in length should be replaced. Also replace damaged brushes.

5.17 Automatic Voltage Regulator

To check the regulator:

- If the generator has low voltage, approximately 2 – 5 VAC as measured at the 120 VAC receptacles, remove F1 and F2 from the regulator. Start and run the generator. If voltage output is approximately 150 VAC measured at the receptacles and engine speed is 3750 rpm, replace regulator.
- If the generator has low voltage, approximately 65 VAC measured at the 120 VAC receptacles, remove F1 and F2 from the regulator. Start and run the generator. If voltage output is approximately 150 VAC measured at the receptacles, and engine speed is 3750 rpm, replace regulator.
- If the generator has high voltage, approximately 150 VAC as measured at the 120 VAC receptacles, and the engine speed is 3750 rpm, replace regulator.

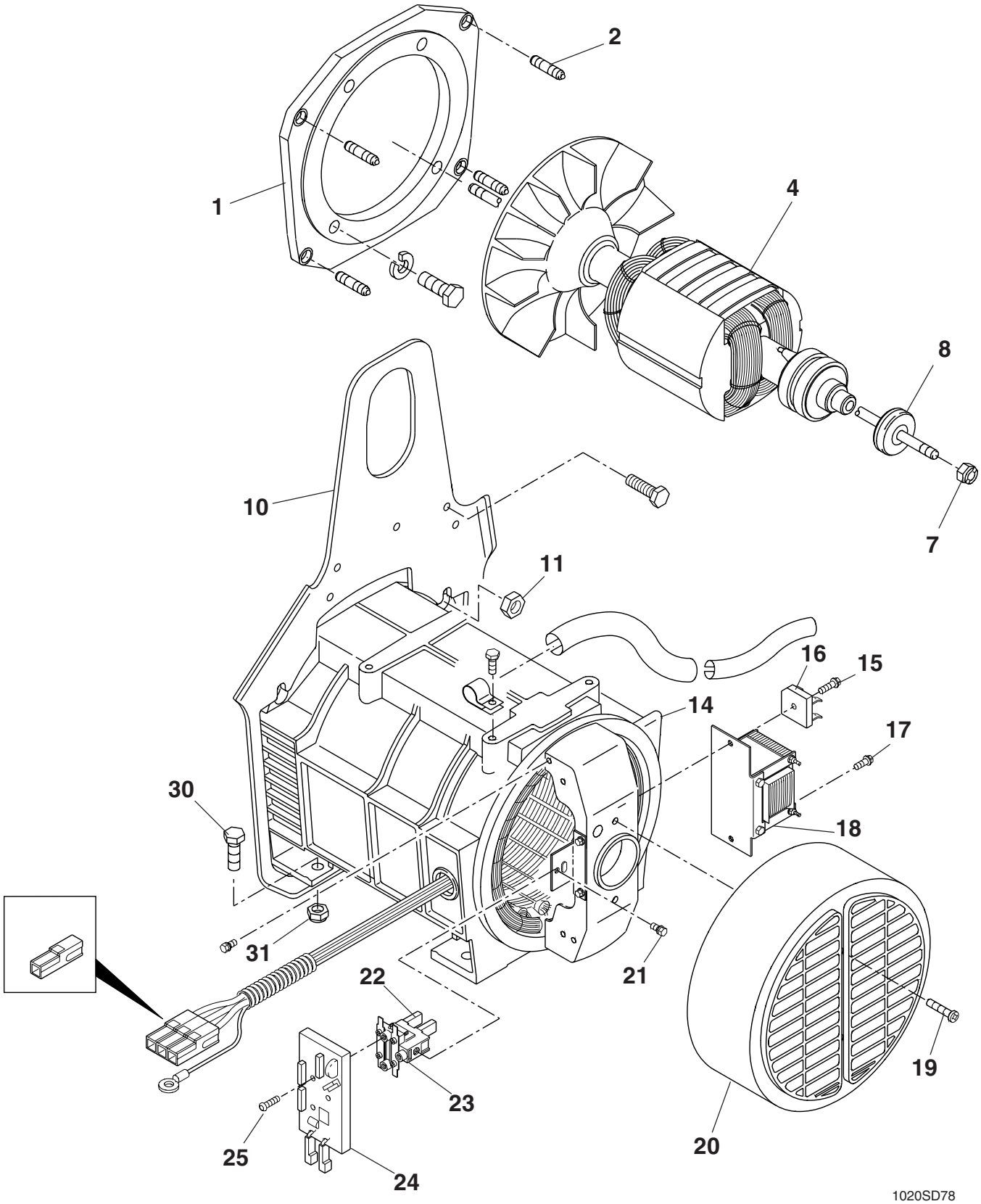


Figure 5-16. Brush Type Generator

5.18 Generator Disassembly

Bridge Rectifier

1. Remove the two end cover screws **(19)** and the end cover **(20)**. See Figure 5-16.
2. Remove the four leads from the bridge rectifier **(16)** confirming lead markings per Figure 5-17.

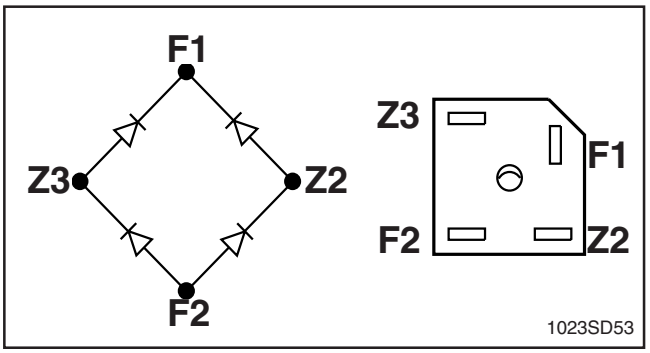


Figure 5-17. Diode Bridge Rectifier

3. Remove the choke/rectifier mounting screw **(15)**.

Choke

1. Remove the bottom mounting screw **(17)** and carefully pull choke assembly **(18)** away from stator **(14)**. See Figure 5-16.
2. Disconnect the two leads (Z1 & Z3).

Fuel Tank and Control Box

1. Remove the fuel tank mounting bolts and tilt the tank to gain access to the gas line and shut off valve.
2. Close the fuel valve and disconnect the fuel line. Remove the fuel tank.
3. Remove the screws that mount the control panel to the control box, and disconnect the harnesses and ground wire from the control panel. Set the control panel aside.
4. Remove the screws that mount the control box to the generator and set control box aside.

Automatic Voltage Regulator (AVR) and Brush Assembly

Disconnect the leads from the AVR **(24)** and brush holder **(23)**.

1. Remove the mounting screw **(21)**, AVR **(24)** and brush holder **(23)**.
2. Remove 3 mounting screws **(25)**.
3. If brushes **(22)** are to be changed, remove the brush terminal plate and withdraw springs and brushes. New brushes must be seated using a medium grade abrasive cloth.

Stator

1. Remove the shaft securing nut **(7)**.
2. Remove the four nuts **(11)** from the four studs **(2)** securing the generator frame **(14)** to the engine adapter flange **(1)**.
3. For units with electric start:
   A. Disconnect the negative lead from the battery terminal first, and then the positive lead.
   B. Loosen battery mounting bracket nuts and slide mounting bracket off the battery.
   C. Remove battery and store in cool dry place.
4. Remove the two bolts **(30)** and nuts **(31)** that mount the stator **(14)** to the lifting bracket **(10)**. Remove the two bolts **(30)** and nuts **(31)** that mount the other end of the stator **(14)** to the shock mounted support.
5. With a block of wood and a mallet, tap stator frame away from the engine. Withdraw stator frame assembly **(14)** over the rotor **(4)** carefully to avoid damage to windings in the stator or rotor.

Note: *On some occasions, the rotor may come out with the stator. If it does, skip step 6.*

6. Support the rotor weight with a sling or place a block between the rotor and base.

Rotor

Rotor **(3)** removed with stator:

1. Place stator **(14)** on flat surface with bearing **(8)** end up. Elevate the stator by placing two blocks of wood on the edge of the stator frame to allow the rotor to drop.
2. Partially screw one of the frame mounting bolts into the bearing and tap screw with a mallet. The rotor should drop out of the stator.

Rotor **(3)** still attached to the engine:

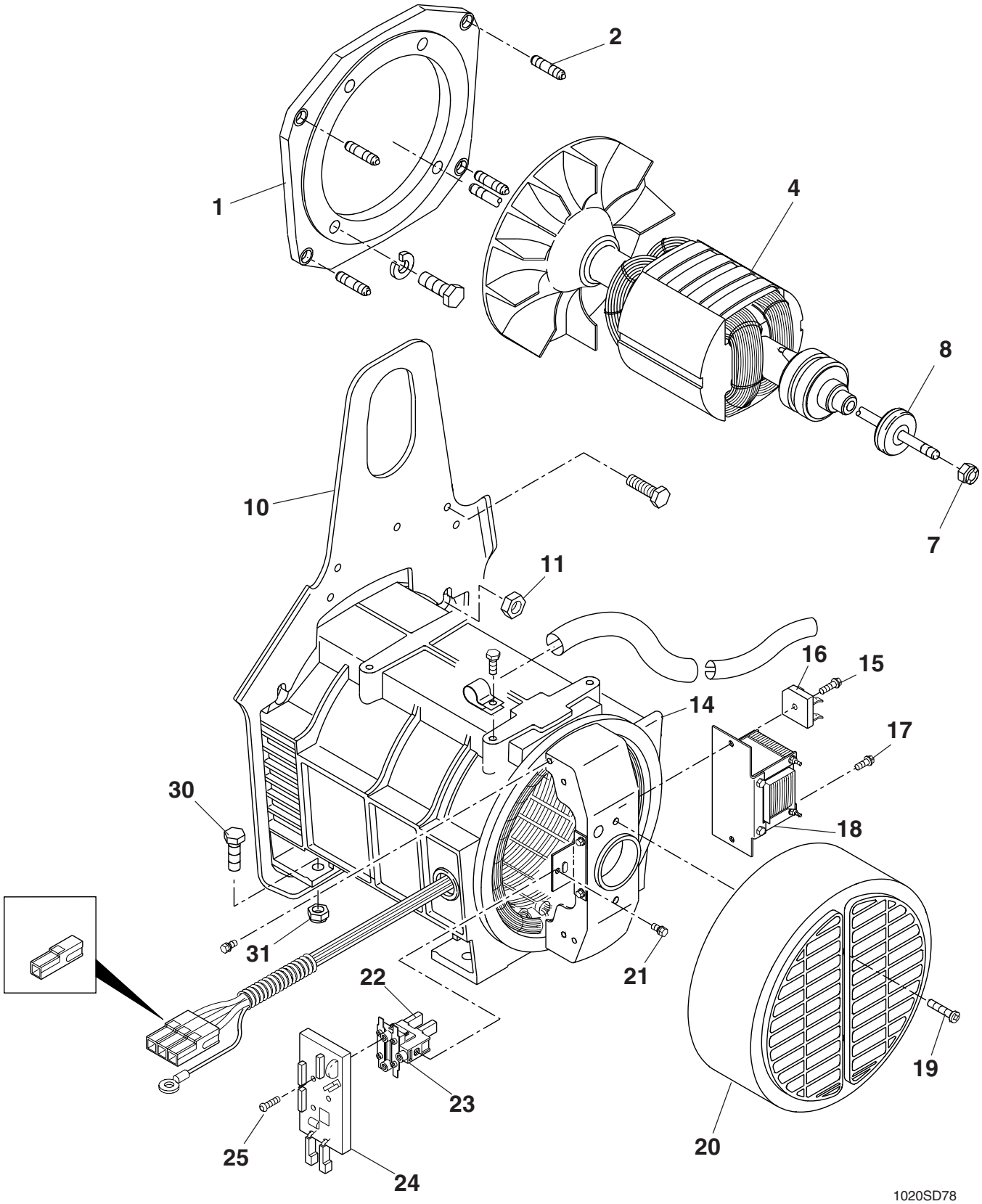
1. Remove stator per instructions above.
2. Release the rotor **(3)** from the engine shaft by supporting rotor in one hand and with a mallet, striking firmly on a pole face.

5.19 Generator Assembly

When assembling the generator be sure to observe the following:

1. Make sure inner taper on rotor and outer taper on the engine crankshaft are clean and free of rust and oil. See Figure 5-16.
2. Install the rotor **(4)** on crankshaft.
3. Slide stator **(14)** over the rotor carefully to avoid hitting and damaging windings. Tap the frame onto the rotor bearing.
4. Attach the four nuts **(11)** to secure frame to the adapter studs **(2)**.
5. Install the washer and shaft securing nut **(7)**. Tighten to 13 ft. lbs. (17.5 Nm).
6. If brushes were changed, reinstall the brushes, springs and terminal plate.

   Note: *New brushes must be seated using a medium grade abrasive cloth.*
7. Attach AVR **(24)** to brush holder **(23)** using three mounting screws **(25)**.
8. Reattach the two leads (Z1 and Z3) to the choke. Using the two mounting screws **(15)** and **(17)**, install the diode bridge rectifier **(16)** and choke **(18)**.
9. Reattach lead to bridge rectifier **(16)**.
10. Install the end cover **(20)** and two mounting screws **(19)**.
11. Reconnect the stator wires **(26)** and **(27)** to the control panel and reinstall panel.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1020SD78

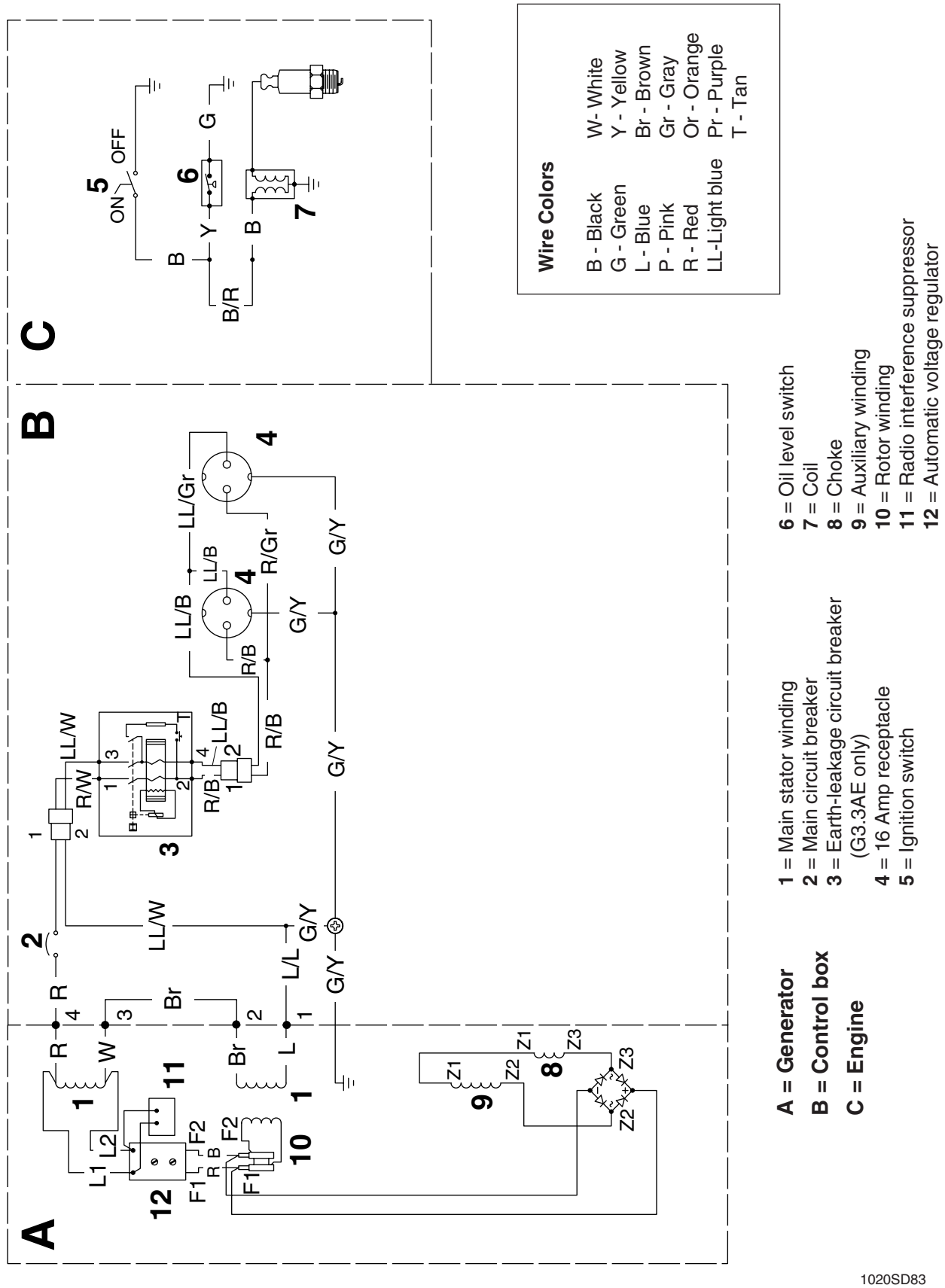
5.20 Troubleshooting

Table 5-2. Generator Chart

Symptom	Possible Cause	Solution
Engine Does Not Start	1. Engine switch is in “OFF” position.	1. Move engine switch to “START” position.
	2. Fuel valves under fuel tank and on engine are closed.	2. Open fuel valves.
	3. Fuel tank is empty.	3. Fill fuel tank.
	4. Choke lever is in wrong position.	4. Move choke lever to correct position. (Close choke lever when starting a cold engine).
	5. Spark plug is in poor condition.	5. Replace spark plug.
	6. Spark plug cap is loose.	6. Tighten spark plug cap.
	7. Engine oil level is low.	7. Refill oil.
No Output Voltage	1. Circuit breaker open.	1. Reset breaker.
	2. GFI open.	2. Test and reset GFI. Replace if defective. Tool or appliance defective, leaking current. (See section 5.12)
	3. Loss of residual magnetism.	3. Flash rotor fields. (See section 5.17)
	4. Defective receptacle or switch.	4. Inspect wiring and components and repair. (See section 5.16)
	5. Connector from generator to control panel is loose or disconnected.	5. Install tightly.
	6. Open or shorted stator windings	6. Test stator and replace. (See section 5.19)
	7. Open or shorted rotor windings.	7. Test rotor and replace. (See section 5.20)
Low Voltage	1. Automatic voltage regulator defective.	1. Test AVR and replace.
	2. Defective choke.	2. Test choke and replace. (See section 5.13)
	3. Defective diode bridge rectifier.	3. Test rectifier and replace. (See section 5.18)
	4. Brushes damaged or broken.	4. Inspect for damage.
	5. Rotor slipping on engine crankshaft.	5. Tighten rotor center bolt.
	6. Rotor winding partially shortened.	6. Test rotor winding resistance. Replace rotor. (See section 5.20)
	7. Slip rings damaged or broken.	7. Inspect for damage or dirt.
High Voltage	1. Automatic voltage regulator defective.	1. Test AVR and replace.
Auto Idle Not Working Correctly (Engine Speed Fluctuating)	1. Idle speed too low, governor hunting.	1. Adjust idle speed to 2650 rpm.
	2. One Amp fuse blown.	2. Replace fuse.
	3. Auto idle switch defective.	3. Test and replace switch. (See section 5.15)
	4. Wire harness disconnected.	4. Reconnect.
	5. Auto idle module defective.	5. Test and replace auto idle module. (See sections 5.7 and 5.8)
	6. Defective auto idle solenoid.	6. Test and replace.
	7. Unit will not come up to speed (GS9.7 / GS8.5 only).	7. Check battery for proper voltage.

5.21 Wiring Schematics – Generator/Engine

Wiring Schematic (G3.3A Model)



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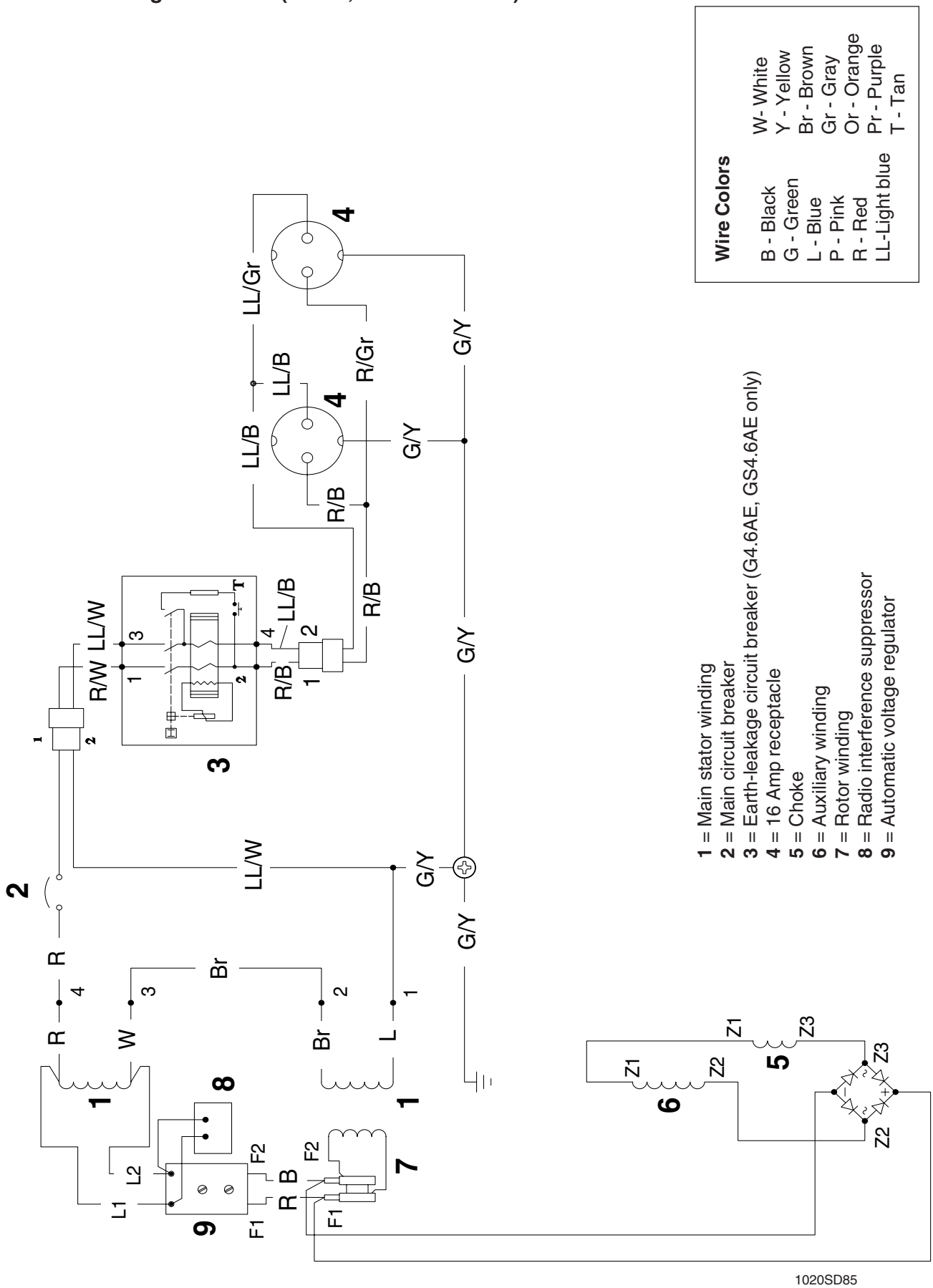
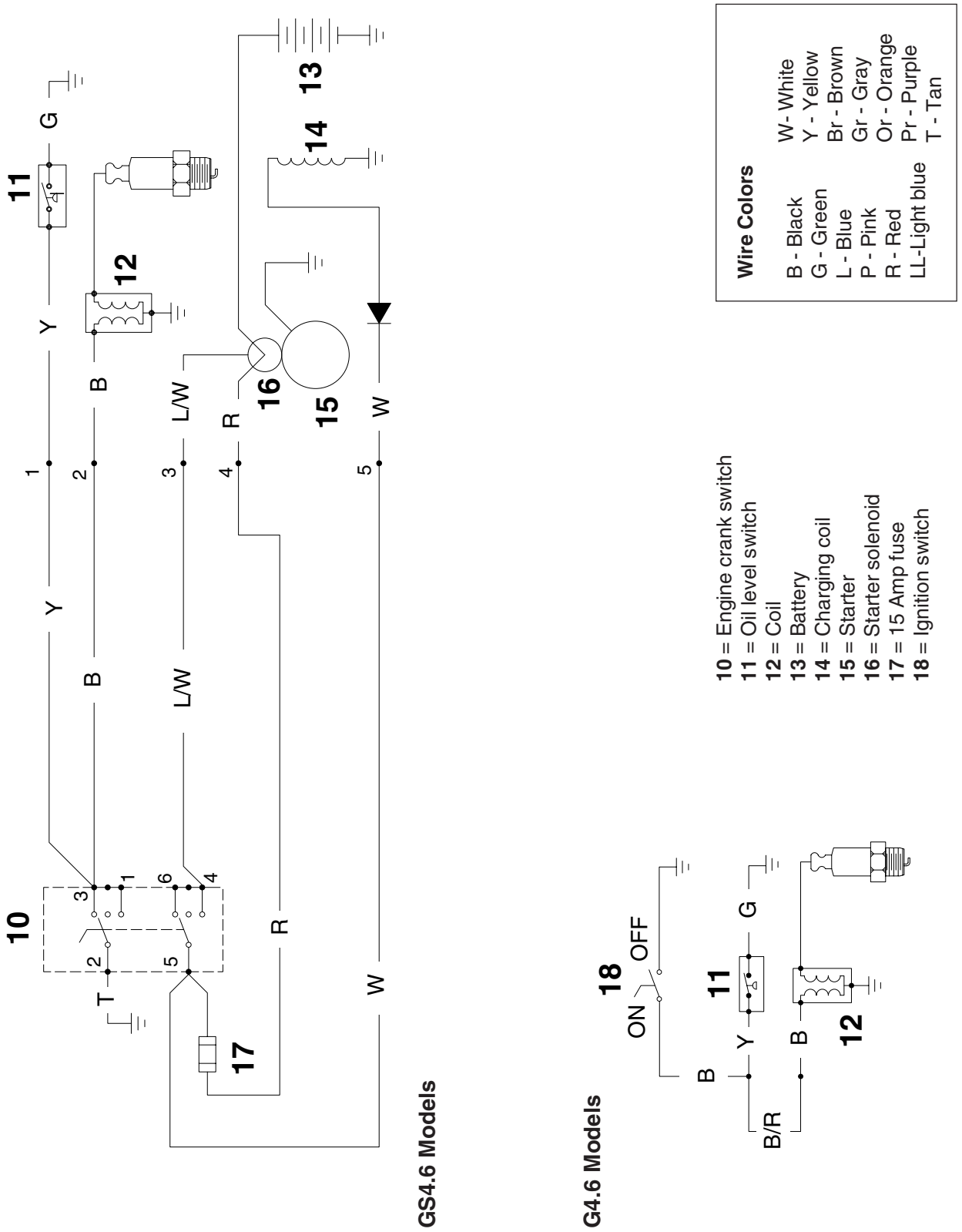
Generator Wiring Schematic (G4.6A, GS4.6A Models)



Engine Wiring Schematic (G4.6A , GS4.6AModels)



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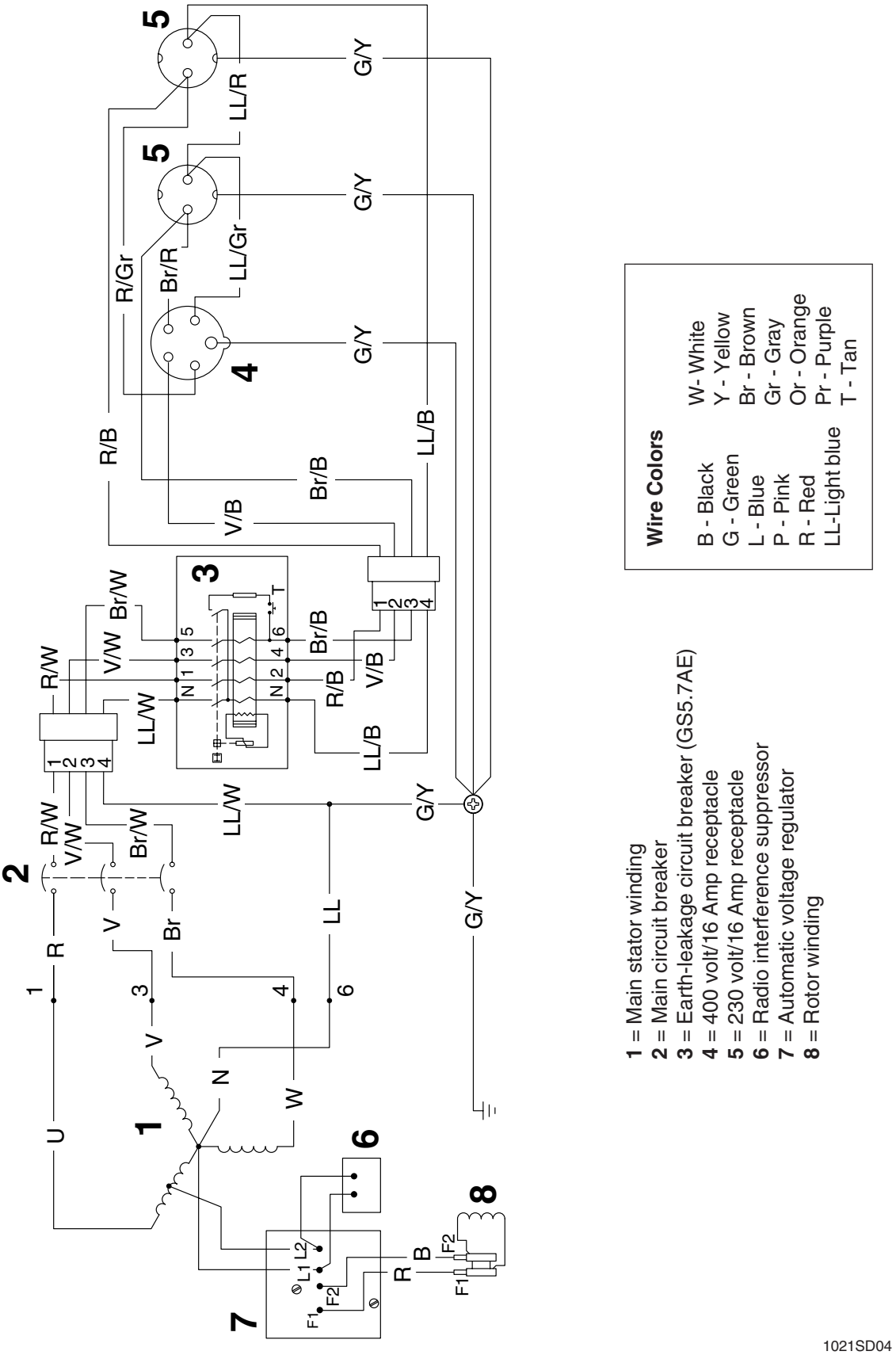
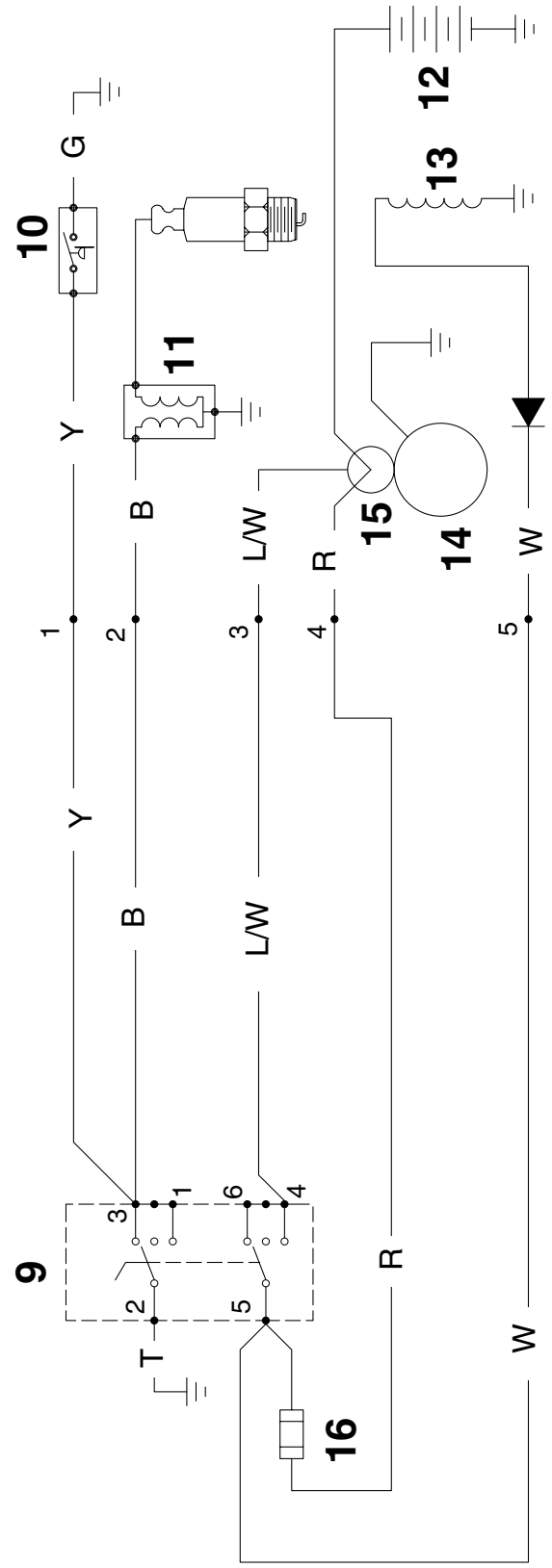
Generator Wiring Schematic (GS5.7A Models)



Engine Wiring Schematic (GS5.7A Models)



Wire Colors

B - Black	W- White
G - Green	Y - Yellow
L - Blue	Br - Brown
P - Pink	Gr - Gray
R - Red	Or - Orange
LL-Light blue	Pr - Purple
	T - Tan

9 = Engine crank switch
10 = Oil level switch
11 = Coil
12 = Battery
13 = Charging coil
14 = Starter
15 = Starter solenoid
16 = 15 Amp fuse

5.22 Storing/Transporting

Before storing generator for a long period of time:

1. Close the fuel valve and remove and empty sediment cup under carburetor.
2. Disconnect the fuel line from the carburetor. Place open end of fuel line into a suitable container and open fuel valve to drain fuel from tank.

WARNING

Gasoline is extremely flammable. Drain fuel tank in a well-ventilated area. **DO NOT** drain tank in an area with flames or sparks.

3. Loosen the drain screw on the carburetor and drain any remaining fuel from carburetor.
4. Change the engine oil.
5. Remove the spark plug and pour approximately one tablespoon (1 ounce) of clean engine oil into the cylinder. Crank the engine a few turns to distribute the oil to the inside of the cylinder walls.
6. Pull the starter rope slowly until resistance is felt and leave handle in this position. This ensures that the intake and exhaust valves are closed.
7. Store generator in a clean, dry area.

WARNING

To avoid burns or fire hazards, let engine cool before transporting generator or storing indoors.

Turn the fuel valves under the tank and on engine to the off position and keep the engine level to prevent fuel from spilling.

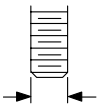
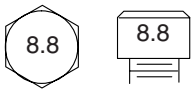
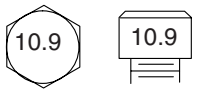
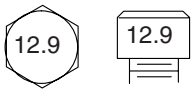
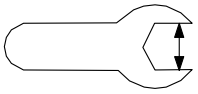
Use Of Threadlockers and Sealants

Threadlocking adhesives and sealants are specified throughout this manual and should be used where indicated. Threadlocking compounds normally break down at temperatures above 350° F (175° C). If a screw or bolt is hard to remove, heat it using a small propane torch to break down sealant. When applying sealants, follow instructions on container. The sealants listed below are recommended for use on WACKER equipment.

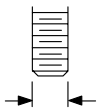
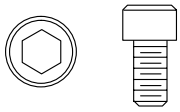
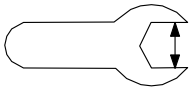
TYPE ( ) = Europe	COLOR	USAGE	PART NO. - SIZE
Loctite 222 Hernon 420 Omnifit 1150 (50M)	Purple	Low strength, for locking threads smaller than 1/4" (6 mm). Hand tool removable. Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	73287 - 10 ml
Loctite 243 Hernon 423 Omnifit 1350 (100M)	Blue	Medium strength, for locking threads larger than 1/4" (6 mm). Hand tool removable. Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	29311 - .5 ml 17380 - 50 ml
Loctite 271 / 277 Hernon 427 Omnifit 1550 (220M)	Red	High strength, for all threads up to 1" (25 mm). Heat parts before disassembly. Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	29312 - .5 ml 26685 - 10 ml 73285 - 50 ml
Loctite 290 Hernon 431 Omnifit 1710 (230LL)	Green	Medium to high strength, for locking preassembled threads and for sealing weld porosity (wicking). Gaps up to 0.005" (0.13 mm) Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	28824 - .5 ml 25316 - 10 ml
Loctite 609 Hernon 822 Omnifit 1730 (230L)	Green	Medium strength retaining compound for slip or press fit of shafts, bearings, gears, pulleys, etc. Gaps up to 0.005" (0.13 mm) Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	29314 - .5 ml
Loctite 545 Hernon 947 Omnifit 1150 (50M)	Brown	Hydraulic sealant Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	79356 - 50 ml
Loctite 592 Hernon 920 Omnifit 790	White	Pipe sealant with Teflon for moderate pressures. Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	26695 - 6 ml 73289 - 50 ml
Loctite 515 Hernon 910 Omnifit 10	Purple	Form-in-place gasket for flexible joints. Fills gaps up to 0.05" (1.3 mm) Temp. range, -65 to 300 degrees F (-54 to 149 degrees C)	70735 - 50 ml
Loctite 496 Hernon 110 Omnifit Sicomet 7000	Clear	Instant adhesive for bonding rubber, metal and plastics; general purpose. For gaps up to 0.006" (0.15 mm) Read caution instructions before using. Temp. range, -65 to 180 degrees F (-54 to 82 degrees C)	52676 - 1 oz.
Loctite Primer T Hernon Primer 10 Omnifit VC Activator	Aerosol Spray	Fast curing primer for threadlocking, retaining and sealing compounds. Must be used with stainless steel hardware. Recommended for use with gasket sealants.	2006124 - 6 oz.

TORQUE VALUES

Metric Fasteners (DIN)

	TORQUE VALUES (Based on Bolt Size and Hardness)						**WRENCH SIZE**			
										
Size	Ft.Lb.	Nm	Ft.Lb.	Nm	Ft.Lbs.	Nm	Inch	Metric	Inch	Metric
M3	*11	1.2	*14	1.6	*19	2.1	7/32	5.5	-	2.5
M4	*26	2.9	*36	4.1	*43	4.9	9/32	7	-	3
M5	*53	6.0	6	8.5	7	10	5/16	8	-	4
M6	7	10	10	14	13	17	-	10	-	5
M8	18	25	26	35	30	41	1/2	13	-	6
M10	36	49	51	69	61	83	11/16	17	-	8
M12	63	86	88	120	107	145	3/4	19	-	10
M14	99	135	140	190	169	230	7/8	22	-	12
M16	155	210	217	295	262	355	15/16	24	-	14
M18	214	290	298	405	357	485	1-1/16	27	-	14
M20	302	410	427	580	508	690	1-1/4	30	-	17

Inch Fasteners (SAE)

	 SAE 5		 SAE 8							
Size	Ft.Lb.	Nm	Ft.Lb.	Nm	Ft.Lbs.	Nm	Inch	Metric	Inch	Metric
No.4	*6	0.7	*14	1.0	*12	1.4	1/4	5.5	3/32	-
No.6	*12	1.4	*17	1.9	*21	2.4	5/16	8	7/64	-
No.8	*22	2.5	*31	3.5	*42	4.7	11/32	9	9/64	-
No.10	*32	3.6	*45	5.1	*60	6.8	3/8	-	5/32	-
1/4	6	8.1	9	12	12	16	7/16	-	3/32	-
5/16	13	18	19	26	24	33	1/2	13	1/4	-
3/8	23	31	33	45	43	58	9/16	-	5/16	-
7/16	37	50	52	71	69	94	5/8	16	3/8	-
1/2	57	77	80	109	105	142	3/4	19	3/8	-
9/16	82	111	115	156	158	214	13/16	-	-	-
5/8	112	152	159	216	195	265	15/16	24	1/2	-
3/4	200	271	282	383	353	479	1-1/8	-	5/8	-

1 Ft.Lb. = 1.357 Nm

* = In.Lb.

1 Inch = 25.4 mm

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